

Developing a Demand-driven Forecasting in Purchasing.

Case company: Son Phuong Co.,. LTD.

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Abstract <p>The ability of foreseeing the future demand allows companies to react in the best profitable manners. Hence, many companies are struggling to adapt a suitable forecasting model. More to that, the conflict happens while preparing for the future within the gap of purchasing and demand planning prevent company to reach this goal. In this context, Son Phuong Co., LTD, a small retailer was seeking their way to obtain the ability of predicting the future.</p> <p>The objective of the research was to develop a new hypothesis Demand-driven Forecasting in Purchasing in order to enhance purchasing. At the end of the research, the author succeeded to create a suitable Demand Forecasting model for the case company. Moreover, a new Forecasting structure and process was established to fulfil the research goal.</p> <p>Mixed method was used to ensure the study is able to deliver high quality outcomes. Quantitative approach aimed to collect data from internal resources to create suitable Demand forecast models while Qualitative approach was conducting interviews to resolve another research questions and research objective.</p> <p>Realizing a great potential business development, the researcher encourages companies and student to adapt and continuously conduct further research to topic related to this hypothesis.</p>		
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Miscellaneous		

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1 Introduction

This chapter aims to provide an entire background of the thesis topic, company and purpose of the new process development. Presentation of the case company - Son Phuong LTD is given as well as the key concepts to resolve the existing problems.

1.1 Topic background

Over decades, the world has witnessed a dramatic growth of supply chain as a product of the complex globalization trend. Thanks to it, production cost is decreasing, making it possible for customers to purchase products with cheaper price. Thus, the responsibility for gaining competitive advantages is now believed to be placed upon forecasting, the ability to hold the future. Interestingly, the relationship between Demand Forecasting and purchasing is considered as the shortcut toward an effective supply chain model.

The huge benefit of Demand Forecasting is undeniable. In September 2013, Vice president – Customer Supply Chain for North America’s Consumer Products Rick Sather pointed out how Kimberly-Clark changed the supply chain concept by shifting from push-driven to demand-driven supply chain and its benefits. From that point on, Kimberly-Clark Corp is seen as the epic demand-driven journey in the industry. Thanks to the application of the new strategy, Kimberly-Clark has managed to reduce waste and cost by “many percentages”, four times the number of equipment changeovers while inventory has been cut about 10 million Dollars. In addition, Vice Sather, vice president of customer supply chain said that the program has brought multi-millions to the company top line. Although the advantage of developing a demand-driven forecasting system is foreseen, many companies are still struggling to develop a proper Demand Forecasting model. (Bowman,2013.)

In 2014, incorrect forecasting costed Walgreens 1 Billion Dollars and led to the exit of two executives. In 2001, demand planning software failure costed Nike 100 million dollars of sales loss. Those two examples showed how bad fore-

casting impacts businesses and raised the flag on the importance for companies to put forecasting as the priority in business operation. (Oti-Yenoah, 2018.)

As mentioned above, the relationship between Demand Forecasting and Purchasing should be paid more attention. The concept of purchasing and its function shall be studied in depth. As a matter of fact, one might still struggle to distinguish the differences between Purchasing and Procurement. While Purchasing is responsible for the transfer of materials, ownership and location change, Procurement processes information that expresses customer expectation and reveals the availability of suppliers (Monczka 2010, 11). It is no doubt that purchasing is emerging as a new strategic element in business development. Being recognized as a vital part of business organizations, Purchasing is proving its portion, shape and form in organizational structure as one of the key roles for earning commercial, competitive success. Thus, having a robust demand planning strategy is prioritised in business development.

1.2 About Son Phuong Co. LTD

This study was conducted on request from Son Phuong Co., LTD, a fast growing reseller, focusing on agricultural products. The company was established in 2013 with its headquarter located in Hanoi, Vietnam. Its product portfolio includes over 400 items which are all imported products. Product portfolio is an important part of the company strategy, which is providing middle and high-end products that are not widely available in the domestic market.

The case company was interested in improving their business performance through establishing a demand-forecasting model. The following figure shows case company's structure of demand planning and purchasing department.

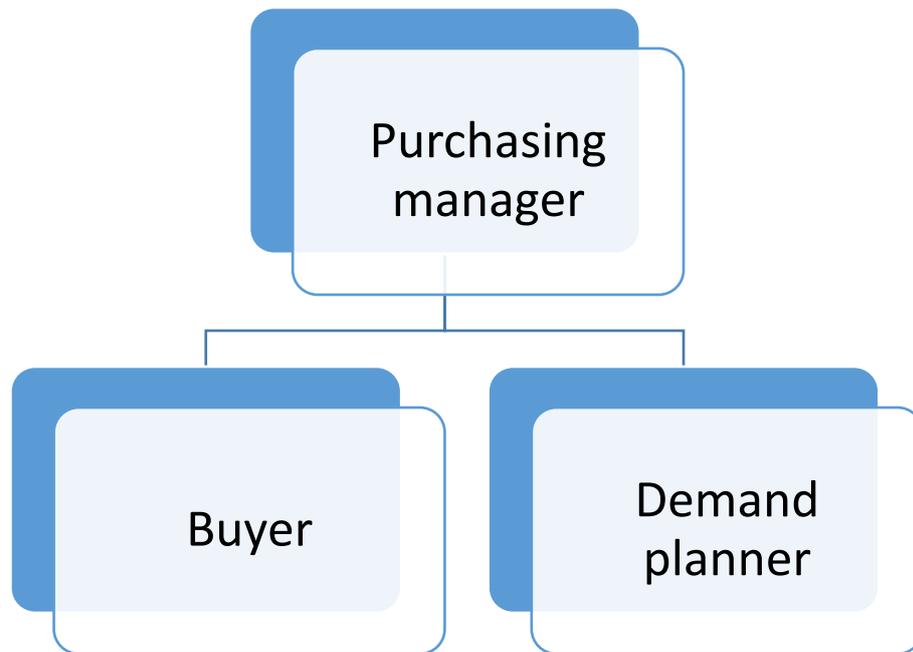


Figure 1: Case company purchasing and demand planning structure

Figure 1 indicates the company's demand planning and purchasing structure. The structure is simple, however, for a small size company like Son Phuong, it is totally acceptable to have a purchasing manager covers both purchasing and demand planning.

1.3 Research objectives and research questions

The goal of the research was to develop a demand-driven forecasting model in order to improve purchasing performance. In addition, this will result in an increase in company's profit through purchasing added value. More precisely, added value created from an accurate forecasting can improve visibility, ensure product and material availability, leading to a better supply chain performance. On another hand, the study will show a fresh perspective of the relationship between demand planning and purchasing with core focus on forecasting, demand planning and product portfolio.

The concept of forecasting, demand planning and purchasing are studied through the current literature. In order to design a suitable demand-driven forecasting purchasing model for the case company, both qualitative and quantitative methods will be conducted, based on interviews with the managers, coordinators and data analysing. Moreover, personal opinions, perspec-

tives are seriously taken into consideration. Through this study, Son Phuong Co. LTD will receive information and guidance about how to design and plan a demand-driven forecasting model.

Stakeholders will also receive benefits from this research since the goal of the research is to provide an accurate input for supply chain in general and purchasing department in particular. Hence, the value gained from this thesis will not only contribute to the purchasing department but also to the whole supply chain.

The academic benefit from demand planning to supply chain or purchasing will not be the main focus of this research since there are plenty of publications and books regarding to the topic. However, a new angle and deeper study on how demand-driven forecasting affects purchasing shall generate a new hypothesis, especially when there are not many related academic studies. The research can also be used as a practical case study or material for students and companies who seek for a suggestion on improving purchasing/supply chain.

The study offers a great opportunity to the researcher to achieve profound insight of demand planning and purchasing. The topic aligns with author's career goals in logistics management, thus providing chances to network with companies in the field and possible future employer.

After thoughtfully studying the case company's vision and carefully observing its business operation, the author became interested in the topic. Since there is no existing Forecasting Model in the case company, there is a huge potential benefit from improving demand planning process in terms of time and cost saving, also indirectly helping purchasing to create added value.

The main task of demand planning team is to provide accurate forecast on demand and sales. On another hand, Demand Forecasting allows other steps such as production planning, purchasing raw materials to be proceeded. Thus, the close relationship between Demand Forecasting and purchasing is undeniable. Naturally, forecasting is never accurate. There are several methods

being used nowadays to provide the most accurate forecast possible. However, to be able to successfully choose the right method for a business, several factors need to be considered. On another hand, it is no doubt that demand planning holds a high position in business strategy and has a huge impact on purchasing. Therefore, the research objective is:

How to develop a demand-driven forecasting which enhances purchasing and business operation efficiency.

To meet the goal of developing a Demand-driven Forecasting model in order to improve purchasing performance, following research questions need to be answered.

Why is it important to develop a tight relationship between forecasting, demand planning and purchasing?

The author intends to show the advantages of developing a new Demand-driven Forecasting structure and process where its direct result can be measured in purchasing. Case studies and literature reviews are used to support answering this research question. Besides, experts from the field are interviewed to express their own opinions about this topic. Furthermore, resolving this question provides a theoretical base to support the study.

How does the existing company demand planning process perform and what is its role in purchasing?

The purpose of answering this question is, firstly, to evaluate Son Phuong operation in depth. The knowledge obtained from answering this question will allow the author to establish a development plan and, on another hand, setting an environment to test the hypothesis, a result from answering research question 3. Thus, it is vital to weight how well demand planning, especially forecasting model performs.

How to develop a demand-driven forecasting purchasing model?

This is the core result of the study, providing guidance and materials to set up a new Demand-driven Forecasting in Purchasing and the fundamentals for future research related to similar topic. More precisely, using result from research question 1 and research question 2 as inputs, the researcher manages to answer research question 3, which is a new process to enhance purchasing through Demand-driven Forecasting.

1.4 Structure of the thesis

This thesis consists of 8 chapters with the content clarified in the following *figure 2*.

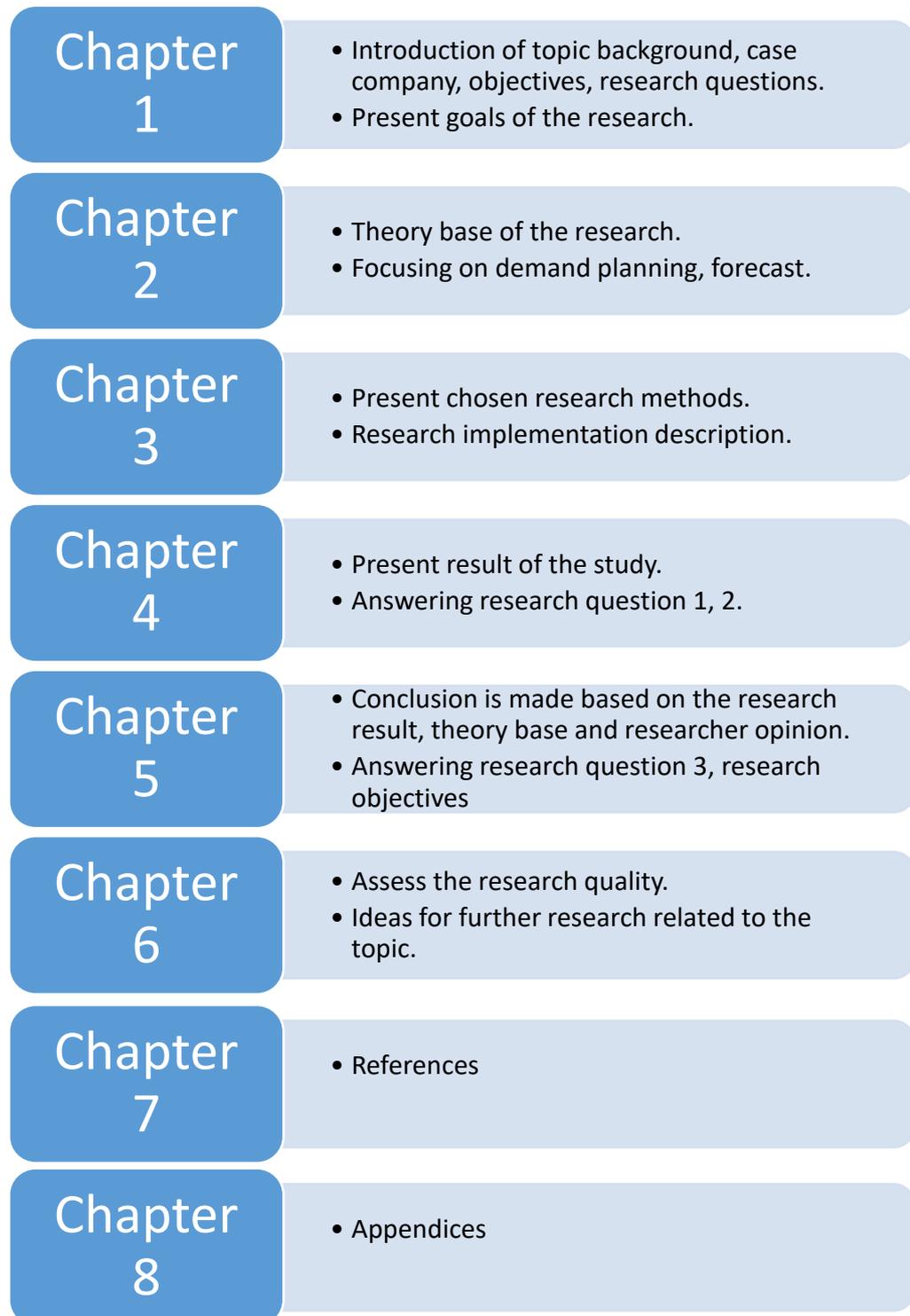


Figure 2: Thesis structure

2 Theory and knowledge base

2.1 Forecasting

Definition and principles of forecasting

Forecasting is a process of predicting what the future looks like. We are forecasting whenever we attempt to predict or estimate a future event. In business, forecasting is used to predict product demand or customer sales. However, it is believed that forecasting involves wider issues rather than just estimating demand and sales. Forecasting is said to be one of the most vital business functions. Business decisions are made based on forecasting to securely generate positive outcomes in the future. Thus, poor forecasting will result in incorrect business decisions which put a company in passive position in meeting demands. Naturally, the consequences of the inability to provide accurate forecasting can be seen in terms of making the wrong decision, lost sales, pursuing wrong markets. Sanders (2016a, 4).

Regardless of the targets, there are main principles of forecasting which hold true. By understanding these principles, it helps operators identify what to expect from Forecasts. Following are the principles of Forecasting.

1. Forecasts are rarely perfect.
2. Forecasts for groups are better accurate than individual items.
3. Forecasts for shorter- is more accurate than longer-time horizons.

(Sander 2016b,18).

Demand-driven forecasting

Because of the new global economic climate which is volatile, fragmented and dynamic, demand generated from the traditional static analytical method is no longer sufficient. To gain the market share, companies are required to have a product category and highly integrated customer strategy. They are deliberately concentrating on demand-driven framework of shaping, orchestrating and sensing demand across channels, geographies, product and customers. It

has been found that supply chain improvement strategy, for example lean manufacturing, is no longer able to build efficiencies, also reduce working capital without remarkable improvements in demand forecast. On the other hand, demanding marketplace and shrinking product life cycles are sharply increasing the cost of correcting wrong demand response. Thus, monthly forecasting is inadequate to provide forecast that captures the changing market while real-time Demand Forecasting is emerging as an effective tool to sense signals weekly, manage demand daily for such a rapidly changing market. (Chales & Chase, 2013).

Process

Naturally, to ensure good forecast outcome, it is essential to follow well-design forecasting process. Regardless of what model is used for forecasting, the following step must be followed.

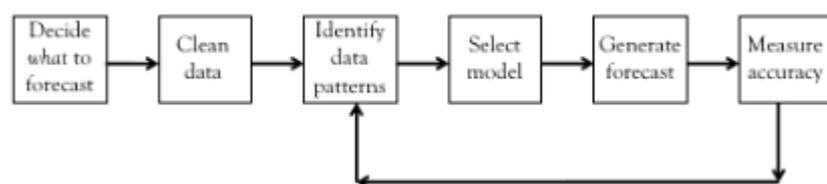


Figure 3: Forecasting process(Adapted from Sander(2016,20)).

Step 1: Decide what to forecast.

4. Address the problems
5. Choose time period to be covered.
6. Make data collection points.
7. Unit of measure decision.

Step 2: Clean Data

Step 3: Data patterns identification

Based on collected data, data pattern can be categorized into the following types.

1. Level or horizontal.
2. Trend.
3. Seasonality.
4. Cycles.

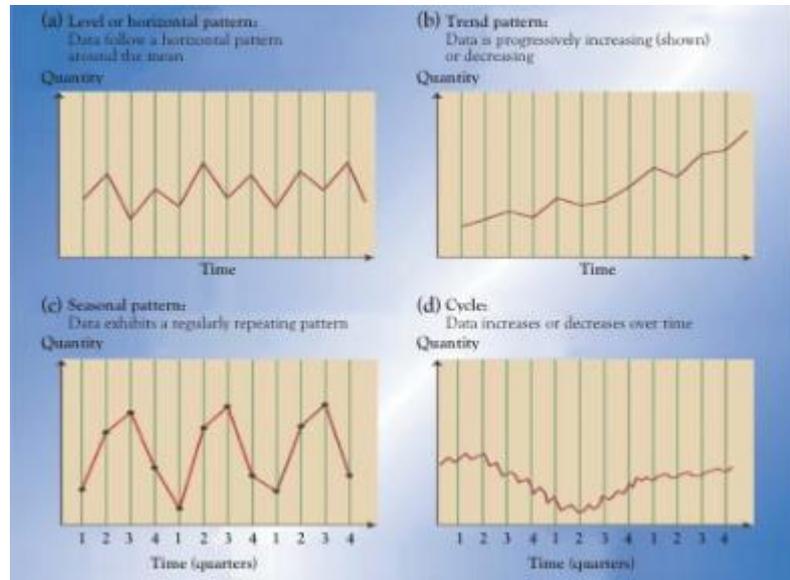


Figure 4: types of data pattern(Adapted from Sander(2016,20)).

Step4: Select Model

It is vital to select the suitable forecasting model for the identified data pattern. In order to choose the right forecast model. Few factors listed below should be considered.

1. Type and amount of available data.
2. Required accuracy degree.
3. Forecast horizon length.
4. Data patterns

Step 5: Generate the forecast

Step 6: Forecast accuracy monitoring

(Sanders 2016, 20-25).

2.2 Forecast models

As the matter of the fact, choosing the right forecast model requires plenty of data, expert consultation. However, some models that fits the does not mean it works well to generate a good forecast. Choosing a forecasting model may lead to misidentify the data pattern. Usually, Seasonality, forecast horizon, length of series, conditions that affect the series are putting into consideration when choosing a forecast model. (Mishra, 2017). Depend on how accurate the forecast that company aims, forecast model is chosen accordingly. Meanwhile, it is crucial to understand types of forecasting model in advance before making the critical decision. (Oti-Yeboah, 2018a).

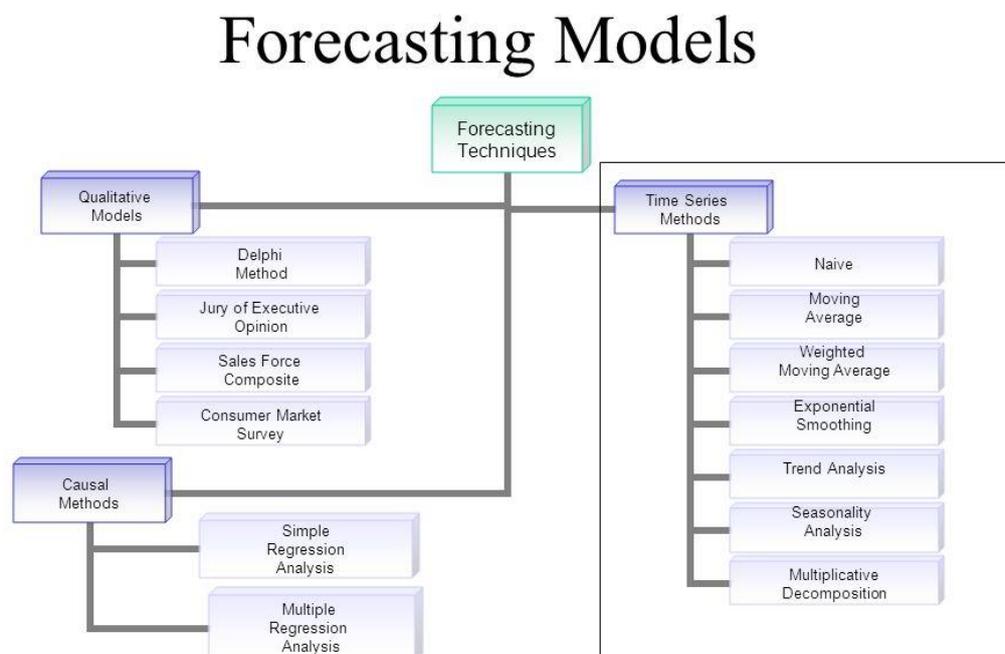


Figure 5: forecasting models (adapted from Singleton, 2016)).

Figure 5 presents the three main major categories of Forecasting methods which are Qualitative Forecasting, Extrapolative Forecasting and Causal Forecasting.

Putra (2009) emphasizes that as long as there is not much systematic interruption within the environment, Quantitative models are believed to work su-

peribly. However, when the pattern of data change, this kind of model is not trustworthy. Qualitative models, in this case, outperform quantitative with its ability to recognize to changes faster and interpret better future. Meanwhile, Nicasio (2018) states that casual models tend to pay attention to the relationship between events and variables, making it more reliable, adapting quickly with different circumstances.

In this research, to ensure the best outcome, four forecasting models were chosen based on resource availability of the case company. The chosen models are Sales force Composite, Simple Regression Analysis, Moving Average and Exponential Smoothing.

Sales Force Composite

Durden (2018) emphasizes that sales force composite is a method based on the company's information gathered from their sales force. The practical relationship with customer and experience create the fundamental for this method. Quite often, salespeople are unable to predict demand of a new product unless they have sold similar product before. Thus, this method is recommended for small amount of existing products and near-term forecasting.

Simple Regression Analysis

This method is used when demand is correlated with some known measurable environment factor such as household income, advertisement, weather, etc. In another hand, it can be understood as Demand (y) is a function of some variables (x_1, x_2, x_3, \dots).

The formular for this method can be find below.

$$y = a + bx - \epsilon$$

To explain,

y - Dependent variable

x	- Independent variable
a	- intercept
b	- Slope
ϵ	- residual (error)

(What is regression analysis?, 2018).

Moving Average

Moving average is a smoothing technique, which is used to estimate the current mean value and is used later on for forecasting the future. This model is considered as a compromise between random-walk-drift-model and mean model. Moving Average is believed to have the ability to cope up with new market forces such as growing demand, globalization, and volatility to reveal prevailing trends of the future. (Gecko, 2018).

The mean of a specific set of values is calculated and used to predict the next period when generating a Moving Average. Its formula is presented below.

$$M_t = (Y_t + Y_{t-1} + \dots + Y_{t-n+1})/n$$

$$M_{t-1} = (Y_{t-1} + Y_{t-2} + \dots + Y_{t-n})/n$$

Subtracting the two equations, we obtain:

$$M_t = M_{t-1} + (Y_t - Y_{t-n})/n$$

To explain,

Y_t	- Observation at time t
-------	-------------------------

M_t - Forecast at time t+1 (Moving average at time t)

$e_t = Y_t - M_t$ - Forecast error. (Thomas & Chiang 2005, 1-2).

Exponential smoothing

Exponential smoothing is said to be effective, robust and versatile method, also easy to interpret and understand. More importantly, the method can be applied to large number of time series in practise thanks for its minimal data and computational requirements (Chatfield. 2001; Gardner 2006).

The Demand Forecasting can be done by using exponential smoothing method require the following equations.

Firstly, time period of a time series is described as the index t. according to exponential smoothing, the level estimate is given by the equation below.

$$\mathbf{Level}_t = \mathbf{Level}_{t-1} + \alpha \times \mathbf{Forecast Error}_t \mathbf{(1)}$$

To explain,

α is the smoothing parameter with the value lies between 0 and 1.

Forecast Error_t is the difference between forecast made and actual demand within the time period *t* which is described by the following equation.

$$\mathbf{Forecast Error}_t = \mathbf{Demand}_t - \mathbf{Forecast}_t \mathbf{(2)}$$

Simple logic of response and feedback is the core concept of exponential smoothing. Basically, forecast is derived from the current level of the time series by forecaster. This output is compared to the actual demand in the next period. The level estimate is adjusted accordingly with the discrepancy between the actual demand and forecast. Thus, the next forecast is always relevant to the current estimate.

$$\mathbf{Forecast}_{t+1} = \mathbf{Level}_t \quad (3)$$

Combining equations (1) , (2) and (3), we obtain

$$\begin{aligned} \mathbf{Level}_t &= \mathbf{Forecast}_t + \alpha \times (\mathbf{Demand}_t - \mathbf{Forecast}_t) \\ &= (1-\alpha) \times \mathbf{Forecast}_t + \alpha \times \mathbf{Demand}_t \quad (4) \end{aligned}$$

Naturally, creating exponential smoothing forecast demands previous forecast, leading forecaster to the question of how to generate a first forecast. An appropriate value need to be chosen for the first forecast. It can be the overall average demand or the data point which is over an average of first few demands.

From equation (4), weighted average over past demand observations can be calculated as the following equation.

$$\mathbf{Weight}_i = \alpha \times (1-\alpha)^i$$

Kolassa and Siemsen(2014,52-54).

2.3 Demand planning

Definition

Demand planning cover three scopes: long-term, mid-term and short-term, including procurement, production, distribution and sales (Stadtler & Kilger 2018, 88).

Demand planning is responsible for predicting demand for items throughout the supply chain by using past forecasts and demand patterns. This useful tool can assist company in producing better accurate forecast in term of revenue streams, inventory level. (what is Demand Planning? Key steps involved in forecasting for a supply chain, 2019)

Demand planning will not only allows businesses and organizations to evaluate the success of the past decisions but also plan for upcoming trends, creating a continuous of refinement and review. To be more specific, the following part reveals some significant benefits of demand planning.

1. Improve the accuracy level of forecasts.
2. Optimize inventory thanks for peaks and troughs.
3. Maximize profitability from product or sales channel.
4. Minimize inventory holding and warehouse cost
5. Manage distribution network effectively
6. Expand to new markets and countries
7. Adapt to changing market conditions quickly

In another words, every area of a business is effected virtually by having a robust demand planning. (Gecko, 2018).

Demand planning is the most misunderstood process and most frustrating of all processes within supply chain. It has been found that companies are satisfied with transportation and warehouse management while demand planning place at the least satisfied (Cecere, 2014).

Demand planning process

Demand planning consist of the flowing steps:

5. Collection of input data such as forecast data based on planning runs, shipments, historic sales and orders, and correction of historic data.
6. Computation of further data.
7. Judgmental forecasting by planners by review the planning and give their input.
8. Consensus forecasting, different views of planners consolidated and dealing with exceptions.
9. Planning of dependent demand.

10. Release the forecast to further process such as further planning and execution process(for example: master planning, purchasing, collaborative planning, allocation planning).

(Stadtler & Kilger 2018, 134-135).

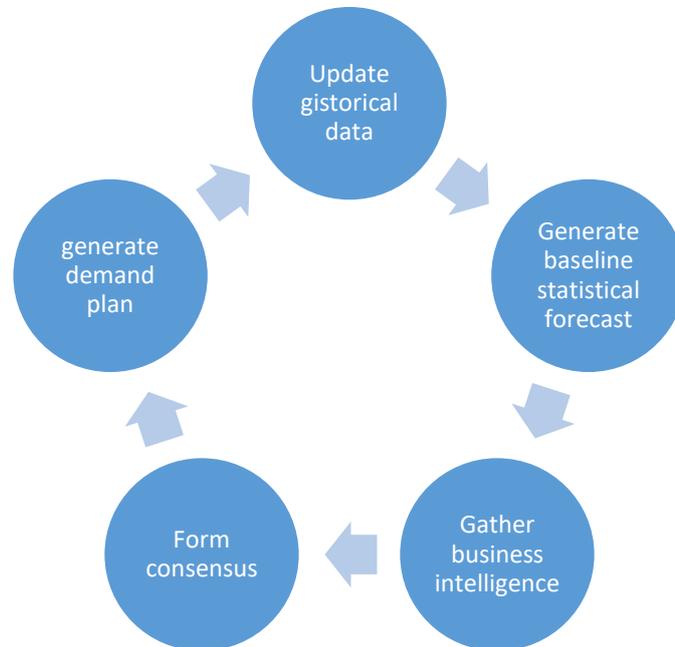


Figure 6: Demand planning process

2.4 Purchasing

Definition

Lyson & Farrington (2012, 4) state that purchasing has no clear definition. Based on perspective, however, purchasing can be viewed as a process, functions, link in relationship, profession, supply chain and discipline. The classic definition of supply chain usually states that: “Purchasing means buying material at the right time, right quality and quantity from the right source and to be delivered at the right time to the right place with the right price” (Op.cit. 2012, 5).

Purchasing is considered as a subset of procurement. Purchasing refers to buying services and goods. Moreover, purchasing includes receiving and payment. In overarching procurement-to-payment cycle, purchasing is responsible for: purchase order, shipment notice, receipt, invoice recording, payment to supplier and 3 way match (Lim, 2018).

Quayle (2005, 3) states that purchasing refer to contracting with suppliers to obtain services and goods required to ensure business operation in most cost and timely effective manner.

Purchasing merely refer to the process of acquisition of property and offering a decent price in return. Purchasing plays a significant role in cost saving strategy. For example, purchasing absorbs over 50 percentages of sales value by just saving 5 to 10 percentages of its cost. (Chunawalla 2008, 12.)

Purchasing ensure company's essential external resources which are vital for running, managing and maintaining the operation such as goods, services, capabilities and knowledge stay at most favourable conditions.

In specific, purchasing aims at:

1. Determine purchasing specifications (quality and quantities) of the services and goods company is in need.
2. Choose the best available supplier and develop routines and procedures to do this.
3. Prepare and conduct negotiations with suppliers for establishing general agreements and legal contracts.
4. Place order to develop efficient handling routines and purchase order.
5. Manage, control and monitor the order
6. Follow-up and evaluate (supplier ranking, supplier feedback and rating, supplier file up-to-date, product file up-to-date, setting claims). (Van Weele 2014, 8-9.)

Purchasing tasks comprise of three different levels:



Figure 7: Scope of purchasing function (adapted from Baily, Farmer, Jessop & Jones (2004, 24)).

Strategic level

Long-range planning, market positioning, availability predicting and policy determining are carried out in strategic level. Top managers make decisions related to this strategic level which may impact on company's competitive position. Some of the strategic level decisions are:

1. Outsourcing of products or services.
2. Creating procedures, task descriptions and guidelines.
3. Making long-term contract with key suppliers.
4. Large investment decisions making,
5. supplier and sourcing strategies. (Van weele 2010a, 282).

Tactical level

Tactical level includes suppliers, process and product selection. Some decisions in tactical level are:

1. Corporate and annual framework agreements.
2. Design and product standardization review through value analysis development.
3. Supply base reduction programs, supplier selection and contracting.
4. Quality improvement through certifications and audits programs.

(Van Weele 2010b, 282).

Operational level

Operational level is responsible for ordering and expediting orders. Material handling, deliveries monitoring and quality disputes are done in this level. Some of the decisions under operational level are:

5. Ordering.
6. Expediting of orders.
7. Quality, supplier relationship and payment issues handling.
8. supplier KPI. (Van Weele 2010c, 283).

Purchasing procedure:

Purchasing procedure consists of 8 steps which describes the sequence of actions need to be taken in order to complete the purchasing function. Those steps are demonstrated in the *figure 8* below (Chunawalla 2008a,19).

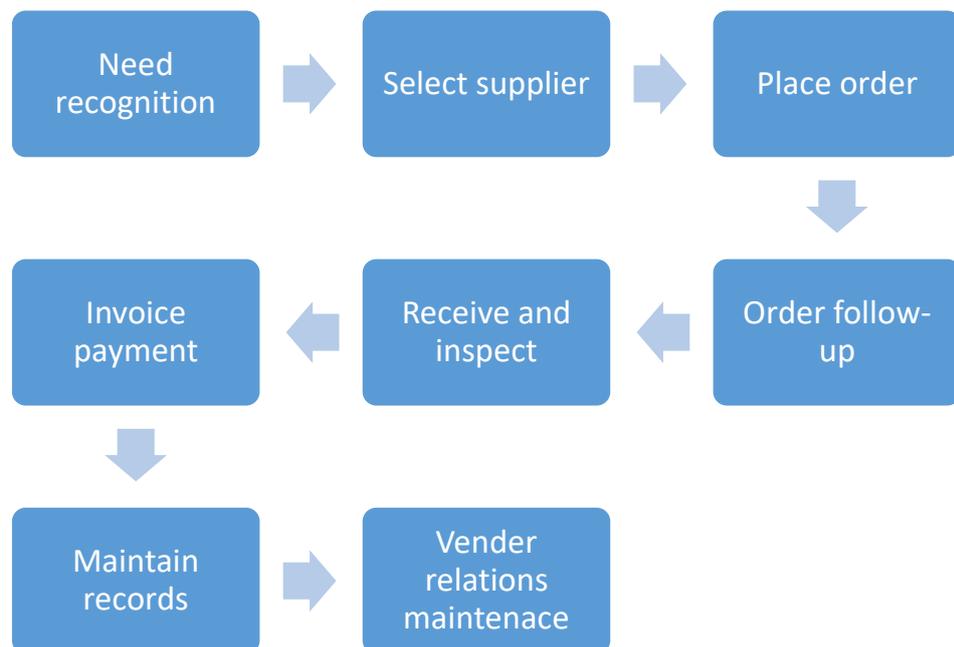


Figure 8: Purchasing procedure process (adapted from Chunawalla (2008,16)).

1. Product or services need recognition:

The procedure starts with the need recognition from the needy section. It may come from manufacturing department, office section or store department.

2. Select suppliers:

This step involves two aspects: searching for possible suppliers and shorting-listing the potential suppliers. Suppliers information is collected from various sources such as advertisements, trade directories, salesman interviewing, trade fair, industry convention, etc. A few selected supplier, in most cases, will be asked for RFQ (Request for quotation), delivery and other conditions and terms. Price, maintenance of quality standards, ability to supply quantity on request and financial standing are crucial when making final decisions.

3. Purchase order placing:

Generally, purchases are made via purchase order form with the selected suppliers. However, it can be made through fax or telephone in case of emergency, the confirmation of the purchase will be sent, following the fax or telephone.

4. Follow up the placed orders:

This step is consider as an essential step in purchasing procedure. The purpose of this step is to confirm the supplier has received the order and the delivery is promised. In addition, review outstanding orders and contact supplier in case of need.

5. Receive and inspect order/goods:

This is done by inbound department or receiving department. The quality of the goods is verified and sent to purchasing department. Any damage, discrepancy are recorded and will be forwarded to suppliers by purchasing department.

6. Invoice payment:

When the received goods meet the qualification, the invoice is checked before approved for payment.

7. Maintaining records:

Naturally, in some industrial firms, past orders serve as a good guide for the future order since the purchases are repeatedly. They can be used to decide the quantity and when to place order. Moreover, it can be used later for data analysis to analyse supplier or improve purchasing performance

8. Maintaining vender relations:

The frequency and quantum of transactions with key suppliers provide platform to set up and maintain relations with them. Trust and time beneficial to both parties are the result from a good vender relations management. The goodwill from supplier can be measured as how efficient the purchasing department is. (Chunawalla 2008b,17-23).

2.5 Purchasing Product portfolio

Kraljic describes the natural feature of purchasing in term of finance and supply risk. Firstly, purchasing has huge impact on profit (volume, cost of material, etc). In addition, the supply risk such as goods quality, supplier scarcity, product availability is always exist within purchasing. In order to choose the right purchasing strategy, products are placed in the matrix where they are categorized into four categories: Leverage, Strategic, Bottleneck and Routine. (Kraljic 1983, 112-114.)

The figure below demonstrates the purchasing product portfolio.

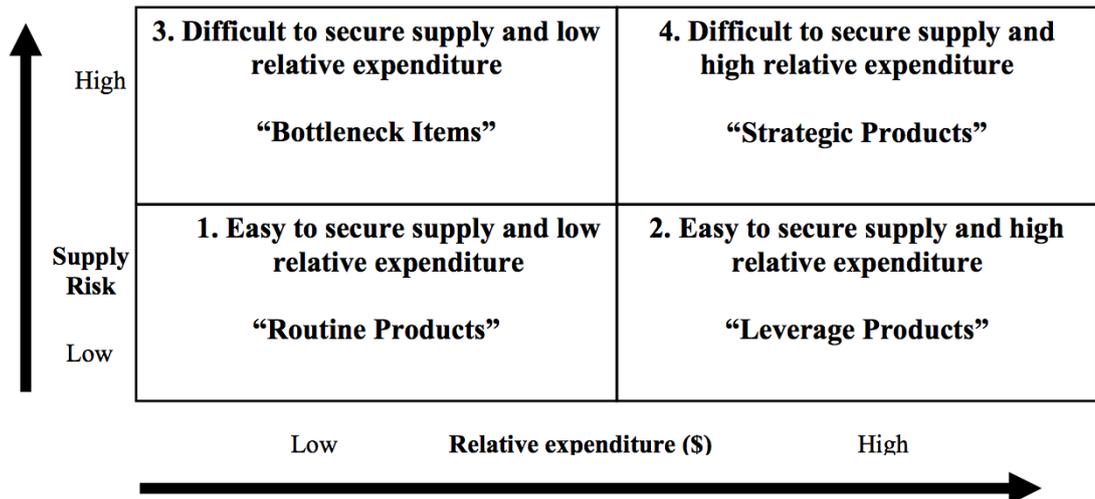


Figure 9: Purchasing product portfolio matrix(adapted from Van Weele (2010, 197)).

Routine products are the least vital to business. Usually, products in this category are easy to access, account for low value with many suppliers available, which means low supply risk.

Leverage products are similar to routine products in term of supply risk. However its position in finance is crucial to purchasing. Products in this category are widely available with great amount of suppliers but it offers potential cost reduction opportunities.

Strategic products are extremely important to business. Its value is high together with the lack of suppliers making this categories the most focus in purchasing.

Bottleneck products are products that have high risk in term of supply risk but account for small value in term of finance. (Caniels & Gelderman 2005, 143.)

2.6 Inventory management

The purpose of inventory is to sustain operations within an economy while management determines policies to establish and distribute inventories the most effectively with the lowest cost. Thus, Inventory management aims to

maximize the profit by optimise the inventory cost but still able to meet the customer demand. In practical cases, to achieve this goal, demand forecast is said to provide current and trustworthy knowledge which can help replace the physical inventory. to be more specific, inventory management is supposed to tackle vital tasks with the help of Demand Forecasting such as planning required inventory, changes in deliveries, unexpected demand. By harmonize inventory through Demand Forecasting, production and procurement will be able to perform their jobs without facing problem due to shortages or delays. Since the forecasting plays important role in those activities, it is essential to ensure that the information is correct and up to date. If the information is misleading or incorrect, the damage will be extremely severe. (Viale 2006a, 3).

Inventory types

Inventory is categorized into 5 types: anticipation stock, safety stock, cycle stock, decoupling stock and pipeline stock.

Anticipation stock is created not to meet immediate needs, but the long term vision. In manufacturing, current orders are immediately need which must be fulfilled within a manufacturing lead time. In businesses where seasonal demands is popular, production run throughout the year to build-up inventory to meet the huge demand since it does not have the capacity to manufacture large amount in a short time period. Thus, creating inventories in anticipation is the result of limiting production capacity. In another case, speculation is the reason for anticipation stock. Raw material, for instant, is expected to increase in the future, it is wiser to purchase large amount of them in advance. Those examples indicates that inventories might be created because of seasonal cycles, limitations and speculative motives which known as anticipation stocks.

Another role of inventory is to meet current demand from stock created by incoming ordered product from suppliers each month. This amount should meet the demands of the following month. Assume that demand occurs at a continuous, constant rate. Left portion amount of stock in figure 10 illustrates the stock life cycle. The average amount of inventory carried in stock is equal to the average time that a unit stays in stock times the demand rate. As inventory

decrease at a constant rate, the average time that a unit stays in hand is one half of the cycle length. The average amount of cycle stock changes, when the cycle length alters, in a proportional manner. Meanwhile, shorten cycle length will also result in reducing **cycle stock** levels. In most cases, replenishment is not instantaneous. The length of time between placing order until receiving the products is called a lead time. The point where order is placed in order to ensure the stock stays adequate is called reorder point. Another type of stock, to ensure product availability against uncertain lead times, is called demand-driven safety stock or simply safety stock.

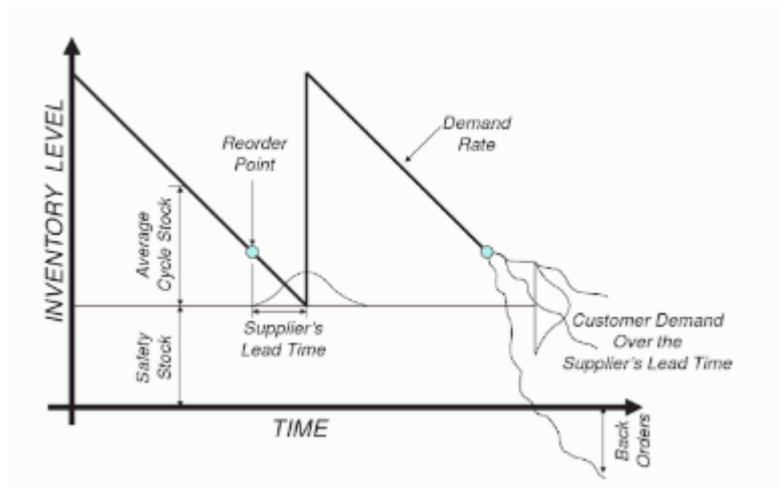


Figure 10: Cycle stock and safety stock (adapted from Muckstadt & Sagra(2010,3)).

Safety stock may be essential to business especially when capacities of suppliers are limited. Unstable capacity results in varied lead times. Thus, inventory is required to maintain customer service. When such situations exist, the inventory is called capacity-driven safety stock.

The fourth type of inventory type is called **pipeline stock** which exists because of the length time between issuing an order until the order is ready for sale or issue at the receiving destination. This length of time is called replenishment lead times. Pipeline stock is equal to the demand over lead times measured by days.

The last type of inventory called **decoupling stock**, which is another type of safety stock. Decoupling stock is the inventory created to protect against vari-

ation in machine break down or processing time. Decoupling stock allows stations to work independently of all others. (Muckstadt & Sapra 2010, 3 -5).

Control inventory with Demand Forecasting

In the effort of utilizing the trustworthy created from harmonizing Demand Forecasting and inventory management, managers are trying to replace physical stock with information. In another word, an effective inventory control can be obtained by consolidating inventory process into an integrated system. The system need to be transparent, able to track and record real time data. However, because forecasting is never absolute correct, there is always fluctuations exist in the system. Thus, finding the root causes of demand forecast error and solution to buffer against it is the ultimate goal of both demand planning and inventory management. In this sub chapter, the importance of demand forecast to different operations in business such as production, procurement, customer service and sales shall be discussed. Furthermore, explain the reason why a company should always reserve some stock to ensure customer service also efficiency. (Sundberg 2009, 18-19).

As the matter of the fact, one cannot control the demand from customer. Thus, companies switch their attention from customer demand toward better understanding of orders and suppliers. This put the burden on purchasing department. When a firm acknowledge of future demand through demand forecast, purchaser is supposed to provide right product at right time in right quantity at most cost effective and avoid the unnecessary stock. However, in real life, this philosophy is not always how purchaser act upon. The reason behind this behaviour is that purchasing aims to gain cost saving from placing big order also to improve supplier relationship. Thus, to balance the conflict between acting according to Demand Forecasting and increasing cost saving put purchasing in a paradox position. (Viale 2006c, 5-6).

To sum up, inventory management is the tool for balancing a business ideal goal of a high customer service level and a cost efficiency solution. It aims to discover a point where both side receive the best profit with the least resources used in a long-term vision. On another hand, Demand Forecasting aims to provide valuable information

2.7 Improving Sales and Operation Planning through accurate forecasting

Marketing are changing quickly at a speed of every minute. Top companies realize the vital role of forecasting the changes in order to adjust or preplanning quickly. Usually, the problem have to be dealt with is numerous. If demand changes suddenly, the supply chain has to react just as quickly. Thus, a good Demand Forecasting is just half of the equation of success. Required resources, which are raw materials, workforce, inventories, budget, production capacity, need to be calculated thoughtfully. The process of ensuring demand and supply are harmonized is carried by Sales & Operations Planning (S&OP). S&OP is a regular monthly planning cycle where internal operation and customer expectations are reviewed for process accountability, lessons learned, accuracy and future risk management. Plans are reviewed predictably and monitored, updated at fixed periods of time. Process owner is well aware of their roles, expectations from top manager. They are in charge of monitoring plans and updating the strategic go-forward proposals. (Krajewski, Ritzman & Malhotra 2018, 568; Sheldon 2006, 4).

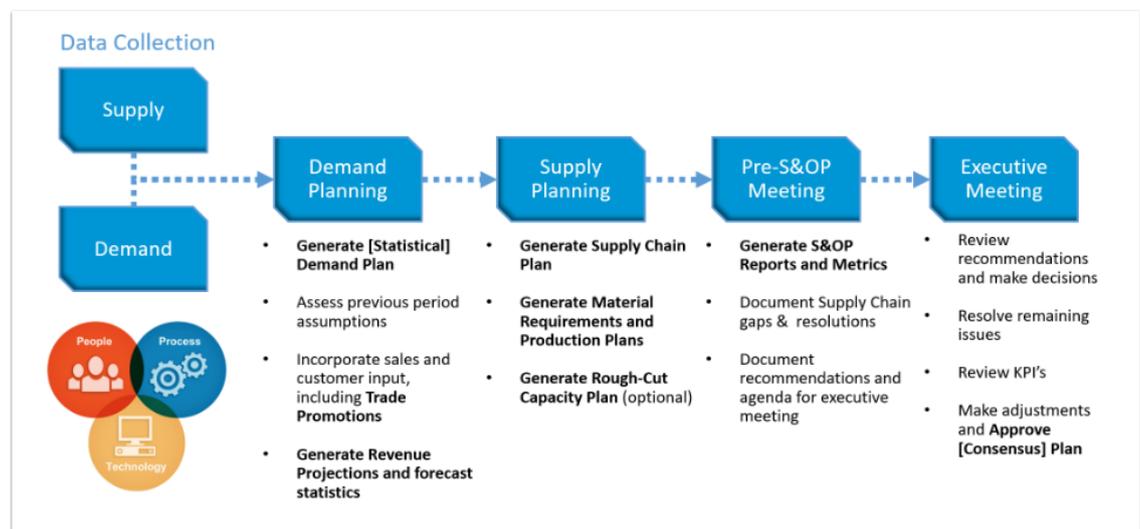


Figure 11: S&OP structure (Adapted from *Implementing S&OP – Recommended Structure And Steps 2018*.)

Demand planning as a strategic role in Sales & Operation Planning

Demand plan, in fact, is the most talked about element in the whole S&OP process due to the fact that it gets blamed firstly whenever problem appear within supply chain. In many business, demand plan or forecasting is done by operations people because demand plan team usually not having enough knowledge of the required work of business planning process. In a big picture, this kind of attitude is no longer being accepted. One must be aware of mutual goals and their variation from their part effect on others of the operation at some degree. Thus, blaming on demand planning demand plan in general and forecasting in specific is not fair. However, being one of the first steps in S&OP, demand planning requires huge amount of input data from various sources which are show in figure 12 below to be able to provide a high quality result. (Sheldon 2006a, 59-60).

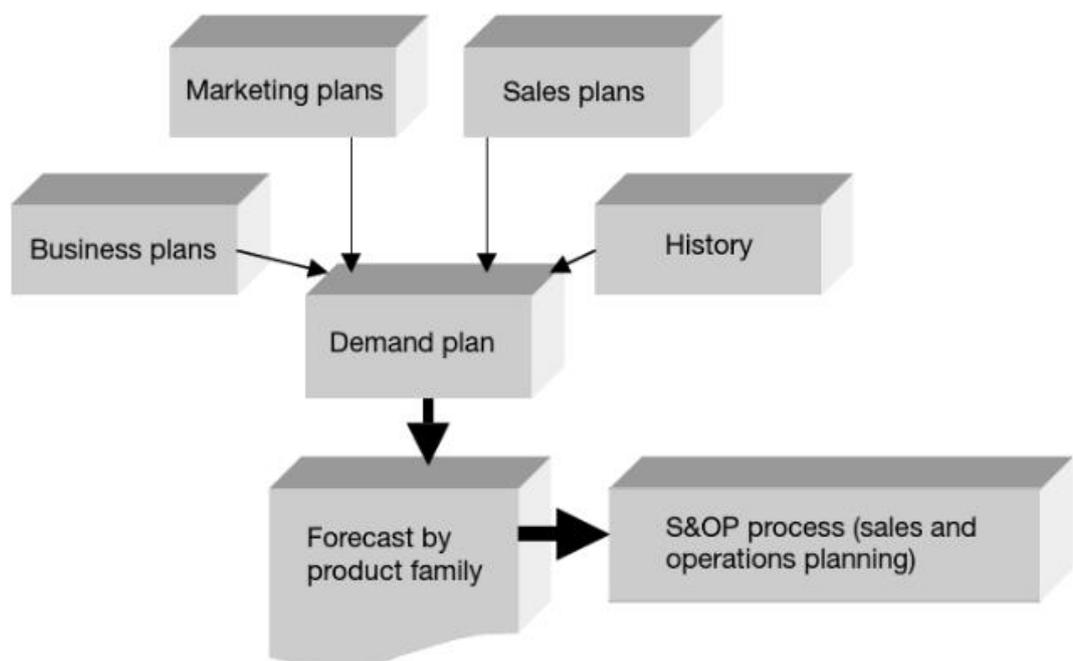


Figure 12: Demand plan input and output (adapted from Sheldon (2006,60)).

Demand planning output, forecast, helps business in term of better understanding of profit potential. Capacity, financing and stakeholder confidence is, indirectly, set up with the help of demand planning process. Besides, it is also considered as the most valuable input to risk management process. (Sheldon 2006b,69).

To sum up, Having an accurate forecasting on hand allow Sales and Operations Planning to improve the business significantly. One needs to realize what can a good forecasting can benefit and what are required to make it happen.

3 Methodology

The research was conducted to resolve the urgent need of a demand planning process for Son Phuong Co., LTD, on the other hand, developing a further demand-driven model and studying its relationship with purchasing. This chapter consists of two sub-chapters. Firstly, Methodological choice, following by research a approach design and data collection process. By understanding the quantity and quality of data, researcher has the ability to perform his analysis wisely while providing readers an easier way to comprehend the results which are presented in the following sub-chapters.

3.1 Methodology choice

To be able to answer successfully the research objective, it was essential to adapt a suitable research method. Due to the given research background and questions, mixed methods approach which consists of both qualitative and quantitative was chosen. By mixing qualitative and quantitative, researcher obtained in depth of corroboration and understanding, in addition to offset the weakness of using either approach by itself. In practice, it is crucial to gain the big picture of the research background as well as evaluating the current demand planning and purchasing operation within the case company to be able to reach the research goal.

Researchers often use quantitative methods to decide what to study, identify specific questions or hypotheses, measure variables to answer research questions or hypotheses, obtain information by using statistical analysis, and generate interpretation of the result. With qualitative, meanwhile, data is collected in the form of audio recording, video or text directly by asking question or indirectly by observing the participants to conduct a thematic analysis. The result of the analysis is presented in the form of literary such as story or narrative. Thus, both research approaches are required to follow the general process: identify the problems, determine research questions and research objective, collect data, analyse collected data, and interpret result. (Creswell 2015, 4).

With the given company case and research objective, the required data consist of internal data such as: latest 18 months sales, latest 18 months purchase orders and interview with demand planning manager and purchasing manager of Son Phuong, demand planners, Inventory planners, purchasers, suppliers from another companies.

Thanks for the significant data approach methods, mixed method approach is suited perfectly in:

1. Result obtained from other methods needs to be validated or corroborated.
2. One method is used to inform another method.
3. Viewing research questions from different aspects, and clarify potential contradictions and unexpected findings.
4. Researcher expects to clarify, elaborate and build on finding from another approaches/methods.
5. Researcher want to develop a new theory about an issue and test it.
6. Generating findings from qualitative research.

Based on the research goal, internal data is required to resolve research question 2. The result from this quantitative method will be used later on as a foundation for qualitative method to answer research question 1 and research question 3. Thus, mixed methods is believed to be the best choice for the study. MaryLynn, Quartaroli, Stephen, & Frances (2011) states that there are three definitions for research that every study needs to fulfil. First of all, a research process consists of enquiry and investigation. A research is systematic and methodical, In other words, a research needs to be well planned and organized with clear processes and steps. Last but not least, research must aim to enrich the knowledge on the subject.

In comparison, all the important required factors are met in this research. Begin with the motivation of developing a demand planning process which drives the author into conducting the research for case company. Furthermore, the case company was suffering from unstable purchasing strategy which is caused by poorly designed demand planning process. Thus, research question was made to resolve the obvious problem. Besides, the thesis is being planned and organized up front from detailed schedule, process to contact detail and material required list. The structure for the this study will be demon-

strated later in research approach sub-chapter. Thirdly, the nature of this research aims to provide practice on developing a suitable demand planning for medium size company. This knowledge can be used for companies, demand planners, purchasers, students, third parties and obviously enrich researcher understanding on the subject.

3.2 Research approach

The graphic diagram presents the systematic research plan, the relationship between methodology, research questions and research objective (presented in section 1.4). The remainder of research objective and research questions are showed below.

How to develop a demand-driven forecasting which enhances purchasing and business operation efficiency.

The Research questions are:

1. Why is it important to develop a tight relationship between forecasting, demand planning and purchasing?
2. How does the existing company demand planning process perform and what is its role in purchasing?
3. How to develop a demand-driven forecasting purchasing process?

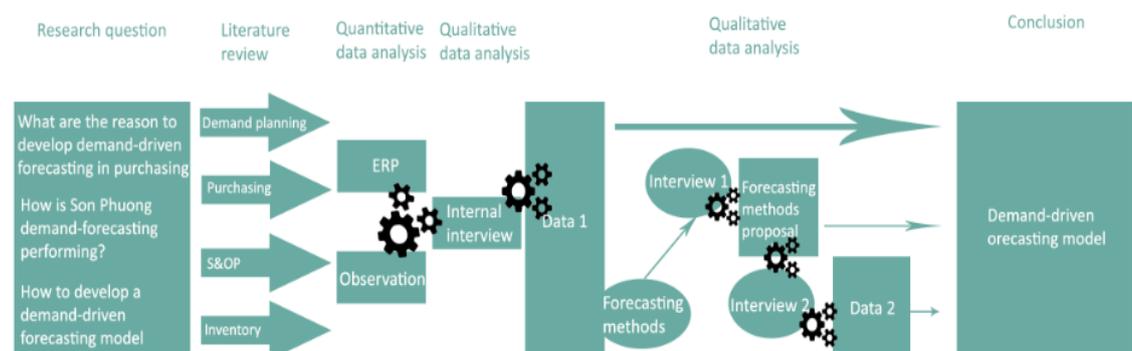


Figure 13: Research approach design

Due to the characteristic of the field (logistics, supply chain) and research goal, the study was conducted under an extremely strong and discreet cooperation with the company.

First step, research questions are analysed carefully in order to gather the right kind of literature review, following by obtaining internal data through ERP, internal interviews and the researcher observation. To be more specific, sales figure within 18 months will be collected as an input to test different forecasting methods. Internal interview requires phone call, e-mail exchange and face to face meeting with various employees in the department of logistics, sales, purchasing and warehouse. Together with these methods, researcher takes part in multiple workshops organized by case company with the aim of familiarizing with the company operation, working environment and specifically expected given work tasks. The great advantage of conducting this qualitative data collection early is being able to create a platform for further research where qualitative method is able to test the hypothesis as well as unfold the omitted ideas and concepts.

Data is collected from various sources though both qualitative and quantitative data collection procedures. As described from the *table 1* below, data used for the research will be undertaken through five main steps including Sampling, permissions, data sources, recording the data, administering data collection.

Qualitative Data collection	Phases in the Process of Research	Quantitative Data Collection
<ul style="list-style-type: none"> • Purposeful sampling strategies • Small number of participants and sites 	Sampling	<ul style="list-style-type: none"> • Random sampling • Adequate size to reduce sampling error and provide sufficient power
<ul style="list-style-type: none"> • From Individuals providing access to sites • Institutional review boards • individuals 	Permissions	<ul style="list-style-type: none"> • From individuals providing access to sites • Institutional review boards • Individuals
<ul style="list-style-type: none"> • Open-ended interviews • Open-ended observations • Documents • Audiovisual materials 	Data sources	<ul style="list-style-type: none"> • Instruments • Checklists • Public documents
<ul style="list-style-type: none"> • Interview protocols • Observational protocols 	Recording the data	<ul style="list-style-type: none"> • Instrument with scores that are reliable and valid
<ul style="list-style-type: none"> • Attending to field issues • Attending to ethical issues 	Administering data collection	<ul style="list-style-type: none"> • Standardization of procedures • Attending to ethical issues

Table 1: Data collection phrases (adapted from Cresswell (2005, 11)).

Quantitative data

Quantitative data is recognized as counts or numbers in which each set of data indicates unique value. This type of data can be used for mathematical calculation or statistics analysis. Random sampling with an adequate size and structured data collection instruments are important factors in quantitative data collection methods. The purpose of quantitative data is to answer questions such as “How many?”, “How often”, “How much”.

In this practical case, 18 months data related to sales, inventory, purchase orders were acquired from ERP system. Data collected from this source is highly reliable. On another hand, researcher took part in multiple workshops with mentioned departments provided by the host company. The purpose of these workshops were to provide the deep understanding of company structure and how well their operation perform. For the first week, full time 8 hours workshops from demand planning and purchasing department were assigned, following by inventory and S&OP department the second week. Besides, it is

worth mentioning that huge amount of e-mails, phone call and meeting had been made to be able to gather all the quantitative data simply because of researcher limited data access on ERP. To be more specific, each phone call lasted for 10 minutes average and 20 minutes for a private meeting.

As a result, data 1 generated from this quantitative method was used to create multiple forecasting model choices with specific pros and cons. At this point, research question 2 was partly answered. This data was included in the interview with demand planners and purchasers from Son Phuong later on in qualitative data collection method. After these interviews, research question 2 were fully answered.

Qualitative data

For qualitative data, primary and secondary data collection were used to ensure the quality of the outcome. To be more specific, second data is documents provided by the case company such as public documents, some discreet employee-accessed documents, guidance and policies. On the other hand, primary data means interviews, discussions and e-mails exchange. The most advantages of such data are accuracy and credibility. (Bryman & Bell 2003, 403-407).

Director, Purchasing manager, Buyer and Demand planner from Son Phuong were chosen for internal interviews. The reason for this decision was to ensure that researcher obtain the deep understanding of how forecasting perform within the company. This allowed researcher to fully answer research question 2. Besides, to ensure the study outcome, professions on the field were chosen carefully. There were total eight experts interviewed for this research. Interviewers information is presented in the following *table 2*. The table consists of interviewer name, company name, company field, interviewer position and interview type.

Name	Company	Field	Position	Type
Truong Pham	Song Phuong	Retailer	Director	Internal
Hoai Nguyen	Son Phuong	Retailer	Purchasing manager	Internal
Tuan Tran	Son Phuong	Retailer	Buyer	Internal
Hai Nguyen	Son Phuong	Retailer	Demand planner	Internal
Olli	Fazer	Food	Top manager	External
Robbert Schrijen	Sanoma	Newspaper	Sourcing manager	External
Teemu Kainulainen	Fiskars	Consumer goods	Master Demand Planner	External
Linh Duong	BD electronics	Retailer	Purchaser	External
Khue Nguyen	Bosch	Technology	Purchaser	External
Thomas	Sanoma	Newspaper	Supply chain planner	External
Peggy	Sanoma	Newspaper	Supply chain planner	External
Kasper	Sanoma	Newspaper	Supply chain analyst	External

Table 2: Interviewers information table

The interviews were divided into two parts. First round interview aimed to resolve research question 1. Combining the result from research question 1 and research question 2, researcher proposed forecasting methods in the second interview. These data collected from interviews formed data 2, which were used to answer research question 3 and research objective later on in chapter 5 discussion. During this qualitative data collection method, phone call,

Linkedin message and e-mail exchange are utilized to organize and maximize the utmost quality. Professional demand planners and purchasers from similar industrial field were aimed for the interviews to ensure the quality of the information.

To sum up, by applying mixed method, the author succeeded in collecting data for resolving the research topic. To provide reader a better view of the research approach, *table 3* visualize the notable highlights of this sub chapter.

	Quantitative	Qualitative
Purpose	<ul style="list-style-type: none"> • Evaluate company operation • Answer research question 2 and research objective 	<ul style="list-style-type: none"> • Obtain deep understanding • Answer research question 1, 3 and research objective
Data collection methods	<ul style="list-style-type: none"> • ERP • Internal interviews • Observations 	<ul style="list-style-type: none"> • First round interview • Forecasting models proposal
Data collection tools	<ul style="list-style-type: none"> • E-mail • Workshop • Interviews • ERP 	<ul style="list-style-type: none"> • E-mail • Linkedin • Phone call • Audio recording

Table 3: Highlights from research approach

4 Result

4.1 Data collection

As mentioned above in research approach sub-chapter of Methodology, data used for this research came from multiple sources, varies from ERP system to similar professors' opinion on the field. Thus, it is essential to present a bit further about this data collection period to provide a context behind the following result presented in this chapter.

First of all, data from ERP system took almost a month to finish up while 4 chosen employees were being interview throughout several meetings. In this part of the data collection period, some of the challenges can be named below.

1. It takes time to obtain all the needed data.
2. Unable to public sensitive data related to finance.
3. Balancing given tasks and thesis work.
4. Delay interviews with top managers due to business trips.

Because of the challenges above, especially challenge 2, results presented in sub chapter current forecasting in Son Phuong is quite narrow. However, thanks for the qualitative data, researcher managed to deliver a thoughtful assessment of the topic.

There were eight professors whose information listed in sub-chapter research approach involved in this study. Not only all of the interview questions, which is listed in Chapter 8 Appendices, were answered but most of the interviewers also showed their interests in the topic by giving their personal opinion of this potential hypothesis. During this qualitative data collection, some of the difficulties the author faced are:

1. Finding suitable interviewers.

2. Arranging interview sessions with Vietnamese – Finnish time differences.
3. Second interviews conflict with many interviewers' holidays.
4. Delivering the research result without violating company confidential.

4.2 Current Demand-forecasting performance in Son Phuong.

Forecasting did not play an important role within Son Phuong due to the stability of the business. The forecast provided from demand planner of the company did not follow any forecasting model.

Firstly, there is no forecasting method being used in Son Phuong. Demand planner generates forecasting by the mix of considering latest sales figure and same period from the previous year. This method works for small amount of products which has stable sales rate but completely fail to forecast products that has complex patterns. More to that, lacking focus of Demand Forecasting, there was no data or report on how effective Demand Forecasting impacts on business operation over the time following by missing chances of business improvement related to demand planning and purchasing.

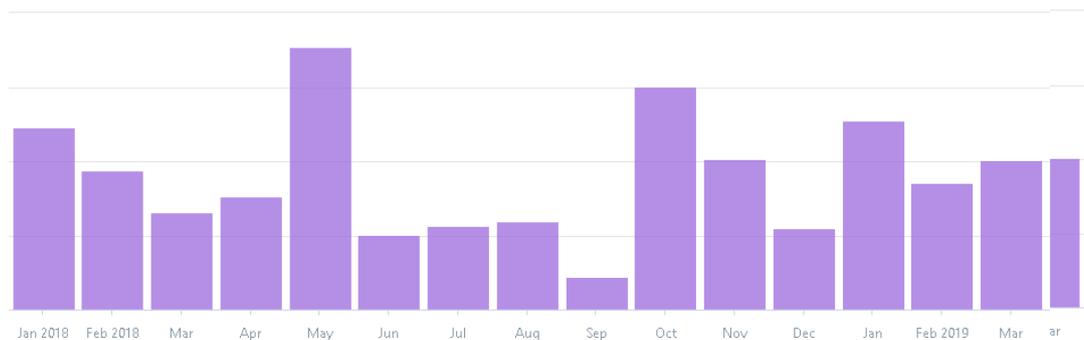


Figure 14: Son Phuong Sales chart from Jan2018 to March 2019

Figure 14 indicates sales of Son Phuong in the period between January 2018 and March 2019. Not to mention May, October and Jan where they had marketing promotion going on which pushed the company sales significantly, the rest of the table indicate quite stable sales. However, interestingly, the period between August, September and October 2018 witnessed dramatic changes. Sales decreased over 50% from August to September due to unable to fore-

cast the sales of a group of promoting product which is on marketing promotion during October. Customer withhold their purchase and waited for the next month. Consequently, during September, Son Phuong paid extra holding cost by unable to predict customer demand.

Besides being unable to provide a quality forecast, the collaboration between demand planning, purchasing and inventory management through forecasting within Son Phuong is also not effective. Often, monthly forecasting is sent to purchasing and inventory team after being made by demand planner. However, this information usually is not put into use by purchasing department. Purchasing team merely use this information as a bar where their order need to be placed higher or equal to this number. In another word, purchasing team, to reach cost saving through EOQ, does not utilize forecasting given from demand planner. Consequently, inventory is quite often caught either having too much products in stock or having no product to delivery to customer. On another hand, inventory control faces extreme headache of mismatching forecast and incoming products continuously.

4.3 Product classification

At the moment Son Phuong's product range consists of over 400 items imported from (numbers) suppliers. The suppliers are all located abroad, which is company strategy, making it costly when it comes to product classification. Specifically, Son Phuong aims to provide high quality imported products to their customer which is the reason why their suppliers are either located abroad or having representative in Vietnam. That is to say more effort is required from purchasing team to constantly seek for new potential suppliers.

According to Son Phuong's Director, the company aims to improve forecast on products that are burden for the company. Thus, it is essential to recognize those items, following by placing them into the right categories. Firstly, ABC analyse is used to identify 20% of products account for 80% of inventory value. *Table 6* in Chapter 8 appendices indicates the list of 20% product that account for 80% of the inventory over the past 18 months.

A glance at *table 6* reveals a table consists of code of product, number of product in inventory, price per piece, total value, percentage share and cumulative percentage share. Name of products are asked to be hidden while price per piece and total price are converted into euros for research purposes.

Originally, there were 65 items. However, to be able to provide a thoughtful product category which benefits demand-driven forecast planning, it is extremely important to generate a list of product where its sales is stable. Considered the time period of 18 months, product with inventory lower than 18 will be eliminated from *table 6* to form a new list which later on being placed on product categories. The new list includes 50 items while the eliminated items are showed below in *table 4*.

order	Product code	Number of product	Price (EUR)	Total value (EUR)	Share Percentage (%)	Cumulative Share (%)
4	TB031	5	5053	25265	3.32	19.94
12	VT2N	1	13862	13862	1.82	37.74
19	TB099	2	5115	10231	1.35	48.37
27	TB2MA	1	7776	7776	1.02	57.73
30	TB094	14	513	7181	0.94	60.60
33	HHF30	10	596	5962	0.78	63.12
43	TBFCCN	5	869	4346	0.57	69.55
45	TB017D0	5	832	4161	0.55	70.66
46	TB0170	8	511	4087	0.54	71.20
47	TBN44	15	262	3934	0.52	71.72
50	TB0171	6	623	3738	0.49	73.23
51	TB0171	6	623	3738	0.49	73.72
52	H5HGC	1	3577	3577	0.47	74.19
53	TBHCHN	9	395	3556	0.47	74.66
55	PDDG	6	586	3515	0.46	75.59

Table 4: Important purchase items from customer request.

Considering the fact that these items are extremely expensive and having great financial benefit to the company, it is worth paying extra attention for this list even though researcher does not include it in his study. Furthermore, its

average value per piece is 2746 euros compared to 678 euros, the average value per piece of the whole *table 6*. Thus, *table 4* is presented as a potential further research which is continuously discussed in Chapter 5 Conclusions.

50 items mentioned above were gone through deep research to be placed into its right categories. Since researcher did not put the whole inventory value into his study, relative expenditure was only narrow within the 20 percentages product inventory value described above. Moreover, substitute suppliers had been researched before categorized. The *figure 15* below visuals the product categories while more detail can be find in *table 6*.

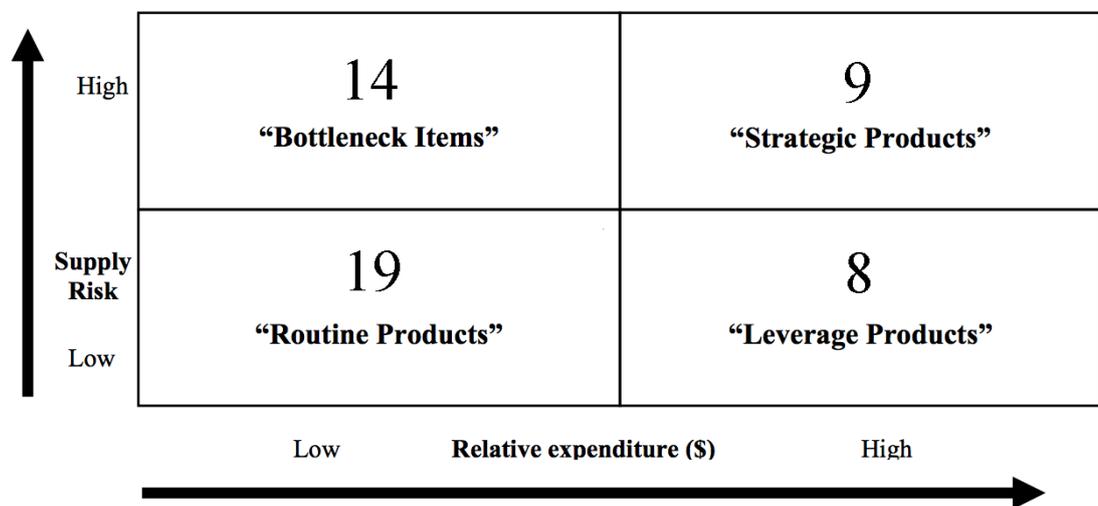


Figure 15: product category.

4.4 Purchasing expectations through Demand Forecasting

There are many strategies in business development that points out the important of building trust, same goal motivation or communicating. However, the most basic action to improve business operation immediately is meeting the expectations. In this Demand Forecasting and purchasing relationship, many expectations are waiting to be met from both sides.

Interviewer 8 said that "quite often demand planning team fails to provide the useful figure for purchasing when it comes to purchasing strategy". The reason behind this can be explained as the misconception between the two apartments. First of all, demand planning aims to describe the future based on historical data collected during business operation. This information is sup-

posed to be used by purchasing department to get the right product, at the right time with the right cost. However, inventory team, S&OP or even supplier also uses this forecasting. Many purchasers have not fully understood this widely important function of forecasting. A top manager from Fazer said that “exchanging forecasting between companies has been used popularly in order to help suppliers demand planning team prepare for production”. This trading information in B2B business between customer and supplier plays a vital role. Supply chain planner from Sanoma emphasis that “Provide supplier accurate forecasting fastens delivery time and allow purchasing team to buy product/material with interesting price”. To void buffer in supply chain, this pre-notice demand is consider as a key factor in building trust between companies. However, purchasing usually does not comprehend this concept, also demand planning team fail to comprehend purchasing ordering plans. This is where the conflict starts. The amount of purchased product is quite often different from given information from forecasting. Thus, it creates problem directly to inventory, production team and suppliers.

Researcher has found that product category has a great potential to resolve this phenomenon. Depend on what kind of product category a product fall into, researcher has strategy for it to decide the amount they purchase. *Table 5* below shows purchasers’ mentality when it comes to placing order through product category.

Product category	Purchasing strategy
Routine	<ul style="list-style-type: none"> - Forecasting is not so important - Prices matter
Leverage	<ul style="list-style-type: none"> - The importance degree of forecasting is various by the consumption and promotion available
Strategic	<ul style="list-style-type: none"> - Forecasting is highly important. - Require frequent audit before execute
Bottleneck	<ul style="list-style-type: none"> - Forecasting is important but price takes the power if there is price advantage.

Table 5: Purchasers mentality in product category

According to interviewer 8 “the mismatch number between some products’ purchase and its forecast provided by demand planning team quite often comes from the fact that forecasting team does not take purchasing strategy into consideration when making demand forecast”. One can easily spot out that purchaser tend to concentrate on strategic and leverage products. “strategic products are obviously the most important simply because of its nature, high risk and value.” Said former purchaser at Bosh. On another hand, Interviewer 1 said that “Even though bottle neck has high risk in suppliers side, it usually not bother purchaser much when making purchase orders.”

4.5 Demand Forecasting model development

A time series model, Moving Average was chosen for the case company, however to test the hypothesis in a more complex environment, Exponential Smoothing method was recommended by interviewer 2, 3 and 6. Several forecasting plan proposals had been made and consulted by professors demand planners from Fazer, Fiskars, Sanoma before this final decision. It is worth to mention that several factors such as company industry, supply chain design, available data, market field, customer segment have great impact on the decision-making process. Being demonstrated in introduction chapter, case company has quite simple structure and stable sales which is dramatically crucial in when it comes to choosing a suitable forecasting method. Sourcing manager from Sanoma stated that “Quite often moving average and experts consultation is adequate for a Demand Forecasting”.

The implementation consists of two parts, first 6 months Moving Average model acts as the company official Demand Forecasting, providing prediction for the future. On another hand, Moving Average serves as a tool to collect required historical data for Exponential Smoothing.

Average moving

Average moving is used for the first 6 months with the purpose of collecting historical data for exponential smoothing method.

Pros:

1. The model is easy to understand and executive
2. Require low training cost and time
3. Excellent to predict future trend
4. Allow case company longer term planning than few months limited as earlier.

Cons:

1. This model does not fit all the product characteristic
2. Unable to predict a long-term vision
3. Might not suitable when company grow bigger or market changes.

Exponential smoothing

As mentioned above, Exponential smoothing is recommended from interviewers for testing the hypothesis demand-driven forecasting purchasing that the researcher is pursuing. First of all, some of the advantages and disadvantages of this model can be named below.

Pros:

1. The model is easy to learn and apply.
2. It can generate accurate forecast.
3. The result indicates more recent observations.

Cons:

1. It might produce forecast which lag behind the actual trend.
2. It does not adapt quickly to the trend. (Aryes, 2016).

5 Conclusions

This chapter presents the main research findings and advices sustainable improvement suggestions to Son Phuong. The investigative question 2 and 3 and also the research question – how to develop a demand-driven forecasting in purchasing will be answered in this chapter.

5.1 Key findings

Research question 1: Why is it important to develop a tight relationship between forecasting, demand planning and purchasing?

As the matter of the fact, demand-forecasting has great impact on many parts of throughout supply chain. Being considered as the driven force of the whole supply chain, Demand Forecasting is always the first to blame whenever troubles arise. However, quite often problems occur within supply chain are found with its root causes lie in the gap between forecasting and purchasing. The conflict between the two departments are usually receive less attention. By closing this gap, there are enormous undeniable profitability and productivity for the company.

1. Why is it important to develop a tight relationship between forecasting, demand planning and purchasing?
2. How does the existing company demand planning process perform and what is its role in purchasing?
3. How to develop a demand-driven forecasting purchasing process?

First of all, many issues in supply chain can be solved by closing the gap between demand-forecasting and purchasing. Being explained in chapter 3, the conflict happens by not fully understand one another functions widen the gap

between the two departments. In a short time period, production, inventory, S&OP and supplier are the direct victims of this conflict. Basically, forecasting passes the information about future demand toward the listed parties which help them in better planning. But purchasing, the one to give the impact, decides to act on its own benefit, causing difficulties to keep up with the planning. The consequences can be extra cost for inventory to hold on stocks, sales lost when it fails to meet the demand, production is unable to make enough products, S&OP ineffective planning. When forecasting, in the long run, keep continuously failing to provide accurate data for involved parties, the supply chain will fall apart.

More to that, besides being considered as the worrisome, forecasting and purchasing itself omit great opportunities for business development. Assuming that purchaser places order base on forecasting, all the information passing around will be correct which enables the system perform perfectly. Unfortunately, purchasing team, in practice, is attached with cost saving and supplier management responsibility which forces them to act upon strategies. On one hand, demand-forecasting aim to provide future vision through historical data while this data later on is not used effectively by purchasing. On another hand, purchasing struggle to balance between flowing the guidance which is used by other departments and achieving its targets. This problem can be solved by tightening the relationship between the two departments.

Research question 2: How does the existing company demand planning process perform and what is its role in purchasing?

Demand planning in Son Phuong was not able to perform effectively. This situation can be explained easily as fail forecasting being the root cause. Vividly, having explained above, improper forecasting method had been providing incorrect forecasts to purchasing department. Thus, the strongest connection between the two departments did not exist.

By adapting this strategy for Demand Forecasting method, the result is obviously unreliable for several reasons. Firstly, needed input for a positive Demand Forecasting, as mentioned above in S&OP literature review part or *figure 12*, are information from business plans, marketing plans, sales plan and historical data collected from ERP. The figures coming from latest sales histor-

ical data which Son Phuong uses only match a tiny basic requirement. Secondly, the used method is unable to generate a data indicating characteristics of products. Asdasd. Last but not least,

At the moment, Son Phuong operation has not yet hit any huge trouble from incorrect Demand Forecasting. However, some visible consequences can be identified such as Ineffective demand planning, sales lost ,h igh warehouse cost.

In the long run, there can be worse damages such as:

1. Ineffective supply chain operating, sales lost, high supply chain cost, etc.
2. Poor Supply Chain Management
3. Market lost

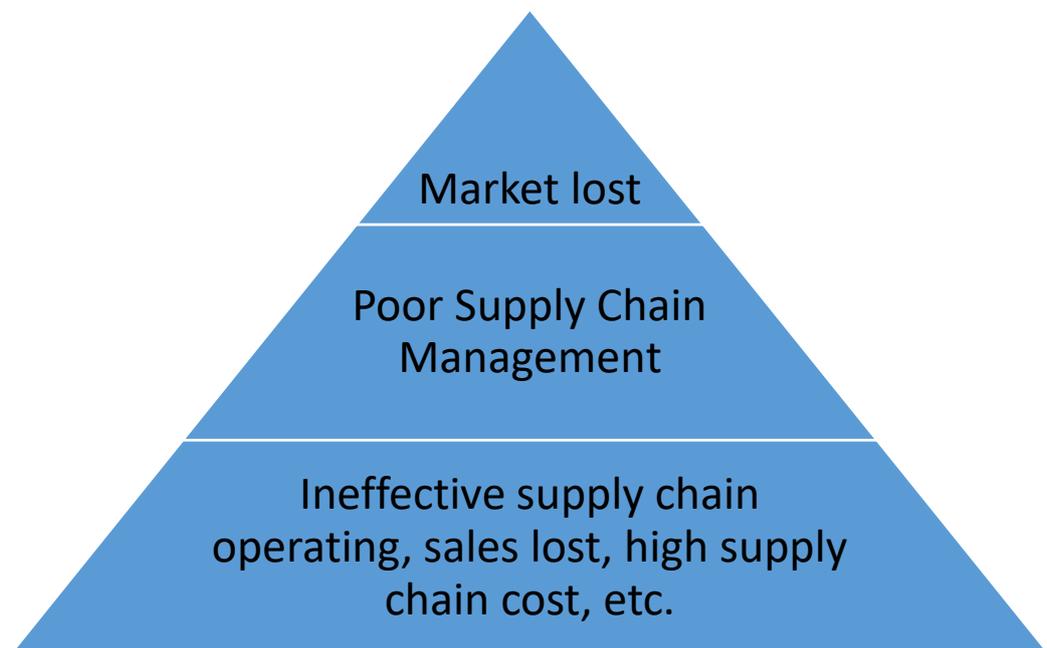


Figure 16: Consequences of poor forecasting.

A glance at *figure 16* provides a dynamic of consequences Son Phuong will face in the long run. Obviously, the urgent need of resolving this ineffective

Demand Forecasting should be considered as one of the most priority in its business development.

5.2 Develop a demand-driven forecasting purchasing model

This subchapter aims at answering the research question 3 - How to develop a demand-driven forecasting purchasing model? The development proposal is suggested based on the result of research question 1, 2, researcher's observation and own personal judgement.

One need to fully understand the concept of demand driven supply chain to be able to understand the demand-driven forecasting in purchasing hypothesis. Demand driven supply chain is a system design to respond to demand signals. Customer demand is the main force of the supply chain, this allow tiers within supply chain to share reliable information and collaborate with one another effectively. (Sirajudeen, 2018). Therefore, demand-driven forecasting is believed to be one of the strategic functions within this demand-driven era. According to Senior supply chain planner from Sanoma, "Predicting future demand determines the quantities of raw materials, amount of finished goods inventories, number of products that need to be shipped, number of people to hire, number of plants to build, right down to the number of office supplies that should be purchased. Demand forecasts are necessary because the basic operations process, moving from the suppliers; raw materials to finished goods to the consumers hands, takes time, particularly in our current global economy. Companies can no longer simply wait for demand to occur and then react to it with the right product in the right place at the right time. Instead, they must sense demand signals and shape future demand in anticipation of customer behaviour so that they can react immediately to customer orders. However, being briefly explained above in chapter 4, result, there are some conflict which potentially impact negatively on the whole supply chain. The misunderstanding gap were clarified by several interviews with experts from demand planning and purchasing. However, to fully tackle this risk, a new process called demand-driven forecasting in purchasing is required to harmonize the way two departments operate. Figure 15 below present the new process.

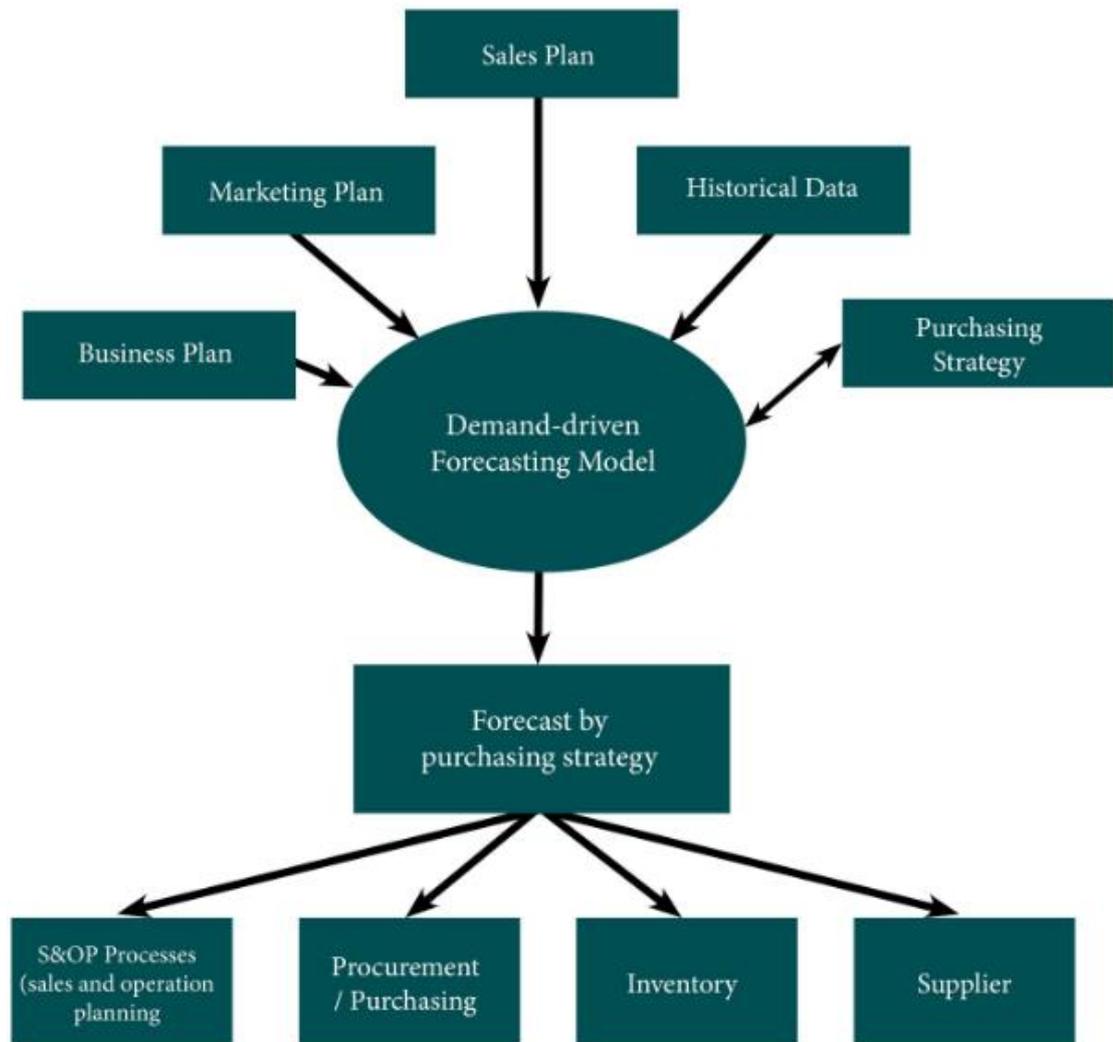


Figure 17: Demand-driven Forecasting in Purchasing process

First of all, the new input for Demand Forecasting consists of business plans, marketing plans, sales plan, history and purchasing plans. This is the first part of every Demand Forecasting model, however, purchasing plans are the new input for Demand Forecasting. Being once presented in sub chapter product category (page 43), depends on different categories, the extent toward forecasting of purchasers are various. On another hand, According to Schrijen, sourcing manager of Sanoma “procurement needs highly accurate demand forecast to negotiate with suppliers to obtain the utmost positive price. Yearly forecasting is usually required as a material in every negotiation”. Researcher believes that, by applying the new input, purchasing expectation is put into consideration when generating forecast, indirectly minimize the risk of conflict in the future. Thus, it is essential to include procurement plans into demand-driven forecasting in purchasing.

Demand forecast is generated after putting input data into forecasting model. This new forecast is divided into 4 main categories, which indicates their purchasing strategy characters. Firstly, demand-driven supply chains require quick respond to customer signals, this division allows both demand planning and purchasing to identify the impact of the changes and react to it positively in an active manner. Secondly, since the interest of purchasers toward different categories is various, this division help demand planners working on the right product groups that important to purchasing.

Before passing the demand forecast toward another tiers, a monthly meeting between demand planning and purchasing is compulsory. During this meeting, prominent figures such as big amounts, sudden increase or decrease amounts, important categories are examined. After this meeting, the audited demand forecast is sent to involved parties. In case there are changes that effect on forecast, especially from customer side, a demand adjustment is consulted by purchasing before audited. Depend on what extent the changes have on supply chain, the new demand forecast can be sent out again. This is the core step of the new process with the purpose to fully integrating purchasing into Demand Forecasting.

5.3 Future research suggestions

This completed study was limited to Demand Forecasting, purchasing and its effect on involved parties such as inventory, production, S&OP and supplier. Researcher tried to investigate the connection between Demand Forecasting and purchasing. The potential of improving business through this connection by testing a hypothesis of demand-driven forecasting in purchasing. To be able to reach the ultimate target of finding a demand driven forecasting purchasing model, researcher managed to evaluate a the case company forecasting performance and its resource. Consulted by professional demand planner, the model for the demand-driven forecasting was made while the process was made by the author. The test of this hypothesis is going until the end of 2019.

For further research, more complex supply chain design environment is suggested to adopt the hypothesis. Ideally, a supply chain network where it requires high degree of accurate in forecasting is likely provide more reliable result. As mentioned in introduction chapter, Son Phuong is a retail company with a lack of Demand Forecasting process. It is essential for the company to establish a solid demand planning in order to cope up with future development. Because of no existing Demand Forecasting methods and reliable historical data, the study took a long time to prepare for the hypothesis-testing period. Moreover, the company structure and its supply chain system are simple, which narrows the testing opportunities. An example, the author was not able to test how production and raw material inventory management react to the new model because the case company does not have such departments.

Another potential further research can be done is risk management. The case company Son Phuong or another company who decides to apply this hypothesis should pay extra attention to this suggestion. Since there are a new process in forecasting and purchasing, it, obviously, omits new risks. Thus, risk management should be the next priority.

This research only cover internal operation, hence, further research where customer and supplier opinions are collected might result in interesting findings. From customer point of view, mentality related to lead time, changing or cancelling orders should be included in the mismatching between forecast and order, how serious do they take the forecast can be good areas to focus.

To conclude, with a potential of further research possibilities, researcher encourage companies and students to extend this research to a broader and deeper level. interview. On another hand, from supplier point of view, how does they react to a

6 Discussion

6.1 Methodological review of the research

In this section, research methods, tools with its validity and reliability are evaluated to provide readers a further view behind the research. First of all, mixed method was used due to the need of a complex data collection. This method allows researcher to develop a hypothesis, in addition a chance to test it. This is extremely important for the study because the topic is completely fresh and demands a robust research. The research tools were used are ERP system, workshops, internal interview, external interview, e-mails, phone call, skype, analysis of ERP data and documents, researcher own observations. To be able to understand the steps and how these tools were used, please consult figure 1, research approach subchapter in methodology chapter. Part of the research was based on literature review from books, journals, articles to help understanding and tackling the issues which arise during the interviews. The rest of the research, which is developing a demand-driven forecasting was made by researcher observation and own opinions.

Reliability and validity

The workshops, internal interviews were relevant and highly important to the study in author's opinion. The data obtained from these sources were valuable and delivered professionally. In addition, data collected from ERP system were useful and detailed. Even though it took quite a while to approach all the data needed for the forecast designing purposes, those data was updated and completed which allow the researcher speeded up the proposal step.

The interviews with professional demand planners, purchasers and top managers from Fazer, Sanoma, Bosch and Fiskar were successful. These interviews were divided into two parts. The first part was to resolve research question 1 while the second part was used to resolve research question 3.

These interviews succeeded to collect valuable data which later on used to fulfil research objective.

Secondary data sources such as books, journals and articles were of good quality, up to date information. More to that, support from instructors from JAMK University of Applied Sciences play a vital role throughout the research.

Overall, the research was conducted in a professional manner with the help of reliable resources.

6.2 Son Phuong Co. LTD feedback

Cuong Pham has been given a chance to assist Son Phuong Co, LTD in business development by establishing a Demand Forecasting model. His work has positive impact on our company in term of profitability and productivity.

During 3 months working at Son Phuong, Cuong pham had proved himself as a young professional trainee at our demand planning team. His performance was excellent, considering the given big workload and thesis work. He managed to provide a good forecasting model by the end of his trainee which is permanently used at Son Phuong. After 2 month of the new forecast model, our company has witnessed a positive outcome. Besides, we are also conducting his hypothesis of demand-driven forecasting in purchasing into testing.

It is interesting to discover how Demand Forecasting effect on our company generally. First of all, out sales are fairly stable since we have royal customers. Secondly, our company is quite small which, in our old thought, might complicate our operation if we have a Demand Forecasting model. However, since we applied a new demand forecast, it helps us in better communicating with our suppliers, actively control our purchase activities and gaining a few better price deals.

To summarize, Cuong pham has successfully finished his traineeship at Son Phuong with a positive outcome.

6.3 Closing words

During my studies at JAMK University of Applied Sciences, writing this bachelor thesis has been one of the most challenging tasks. This study was to help Son Phuong in developing a suitable forecasting model, on another hand, testing a hypothesis – demand-driven forecasting purchasing. During this journey, I had opportunities to work with many experts and learned from them. Furthermore, I was able to manage my own project and develop my skills. There were many valuable lessons I have learned from this, and I believed I succeed in providing a fine outcome.

It had taken me several months to set my goal thoughtfully before I decided to apply to write this thesis for Son Phuong. There are a few significant reasons behind this decision. First of all, Son Phuong is a small size company where employees is not only expected to take ownership in their job but also encouraged to propose business development solutions. It allows me to maximize my leadership and management skills. As an independent thinker, I always seek for chances to widen my ability by tackle challenges. Moreover, the company field is strongly related to logistics, which aligns with my studies. Thus, I found Son Phuong provides an ideal environment for my self-development journey.

During conducting the study, I spent lots of time for reading. Variety sources of academic books, journals and articles regarding to purchasing and forecasting provide me guidance of how my research should be done. Since my major is logistics engineering, I was familiar with purchasing, however, demand planning was a tricky part. The research is unable to generate valuable results without knowledge of demand planning. I was forced to take an introduction to demand planning course on Edx.org to fully understand about demand planning and Demand Forecasting because one of the main task of this study was to design a Demand Forecasting model for the case company.

Thanks for this research I had pleasures to work with many experts from highly respected companies in the field. I managed to maintain some connections with them afterward.

It is also worth to mention few tasks could have been done to improve the quality of this study. First of all, the length of the research should be at least 8 months since the trial of moving average Demand Forecasting already took 6 months. Originally, I had only 3 months to delivery this research, which was in the middle of the trial of the new model. Thus, the result of the implementation was not fully presented. Secondly, more experts from different involved department with Demand Forecasting should also be included in the qualitative data collection. These opinions will help improve the quality of the data, indirectly provide a deeper research outcome. Thirdly, my organizing skill could have been better, especially with time management. To be more clear, I failed to interview one of the demand planner, was not able to meet one of my research deadline due to poor interview scheduling skill.

Overall, many valuable lessons I have learned from conducting this research will surely help me in my future career. I am extremely grateful to receive plenty of supports to finish this study.

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8 Appendices

Interview question list for demand planners

1. In your opinion, why company needs forecast/demand planning team?
2. How does forecast effect on purchasing department specifically? Can you give some examples ?
3. In your opinion, what are the measurements to define a good forecasting model? What are the requirements for generating a forecasting ?
4. In your opinion, what are the differences between traditional Demand Forecasting and demand-driven forecasting? Can you give an example in practical working life?
5. What are the benefits purchasing department directly earns from a good forecasting? Can you give an example ?
6. Can you describe the exiting demand-forecasting process in your company? (What method your company is using? why this method?)
7. What are the obstacles you have been facing in your job when passing the information down-stream in supply chain, especially to purchasing department? (do they trust your information? do they react quickly? Do they do their job without putting your data into consideration? Etc.)
8. What forecasting method do you think is the best ? quantitative or qualitative ? can you give an explanation.

Interview question list for Purchasers

1. What is the role of Demand Forecasting from purchasing point of view ?
2. How does purchasing effect on demand planning/Demand Forecasting? Can you give some examples ?
3. What are the benefits purchasing have from Demand Forecasting ? can you give some example ?
4. From your point of view, what can Demand Forecasting do to improve purchasing ?
5. In your opinion, what can purchasing do to contribute to a better forecasting ?
6. What are the challenges purchasing usually face which derive from a bad forecasting ?
7. In your opinion, what is the relationship between Demand Forecasting and product category ?

	Product code	Unit	Price - EUR	Total value - EUR	Share Percentage	Accumulative	Type
1	TB2H1	260	249	64611	8.50	8.50	Strategic
2	TB2H0	112	279	31246	4.11	12.60	Strategic
3	TG4LH1	125	244	30498	4.01	16.62	Strategic
4	TB031	5	5053	25265	3.32	19.94	
5	TG5LH1	105	199	20890	2.75	22.68	Strategic
6	TB21	6295	3	19618	2.58	25.26	Leverage
7	CG1G	1005	19	19593	2.58	27.84	Routine
8	TB0164	1400	13	17612	2.32	30.16	Leverage
9	TBALL	2900	5	15923	2.09	32.25	Leverage
10	TB080	4325	3	13941	1.83	34.08	Bottle neck
11	HHRQ	226	62	13908	1.83	35.91	Leverage
12	VT2N	1	1386	13862	1.82	37.74	
13	OSHM 1	70	187	13066	1.72	39.45	Strategic
14	OGHIM 3	60	200	12000	1.58	41.03	Strategic
15	TBMAP	88	136	11964	1.57	42.60	Strategic
16	HHKQ	202	58	11641	1.53	44.14	Bottle neck
17	V1TN	92	121	11098	1.46	45.59	Strategic
18	CGG	345	32	10881	1.43	47.03	Leverage
19	TB099	2	5115	10231	1.35	48.37	
20	OSHM 2	55	185	10154	1.34	49.71	Strategic
21	HH09	450	21	9441	1.24	50.95	Bottle neck
22	TES1T	420	22	9308	1.22	52.17	Leverage
23	TB0107	2881	3	9005	1.18	53.36	Bottle neck
24	TBJ136	15000	1	8942	1.18	54.53	Bottle neck

25	TB0110	2782	3	8634	1.14	55.67	Bottle neck
26	TBCN014	115	69	7921	1.04	56.71	Leverage
27	TB2MA	1	7776	7776	1.02	57.73	
28	CG3G	3500	2	7404	0.97	58.70	Bottle neck
29	TBJ43	974	7	7269	0.96	59.66	Leverage
30	TB094	14	513	7181	0.94	60.60	
31	TB0241	3348	2	7024	0.92	61.53	Routine
32	TB032	6341	1	6170	0.81	62.34	Routine
33	HHF30	10	596	5962	0.78	63.12	
34	TB058	530	11	5815	0.76	63.89	Routine
35	TB0234	505	10	5254	0.69	64.58	Routine
36	TB068	48	105	5035	0.66	65.24	Bottle neck
37	TB0Y40	1475	3	4922	0.65	65.89	Routine
38	TBCN003	805	6	4916	0.65	66.53	Routine
39	TBSMO	36	135	4846	0.64	67.17	Bottle neck
40	TB0252	37	129	4774	0.63	67.80	Bottle neck
41	TBIU41	1200	4	4615	0.61	68.41	Routine
42	TB0183	45340	0	4355	0.57	68.98	Bottle neck
43	TBFCCN	5	869	4346	0.57	69.55	
44	TG19	200	21	4288	0.56	70.11	Routine
45	TB017D0	5	832	4161	0.55	70.66	
46	TB0170	8	511	4087	0.54	71.20	
47	TBN44	15	262	3934	0.52	71.72	
48	TBH147	400	10	3923	0.52	72.23	Routine
49	VP1N	55800	0	3863	0.51	72.74	Bottle neck
50	TB0171	6	623	3738	0.49	73.23	
51	TB0171	6	623	3738	0.49	73.72	

52	H5HGC	1	3577	3577	0.47	74.19	
53	TBHCN	9	395	3556	0.47	74.66	
54	TBXL3C	84	42	3554	0.47	75.13	Routine
55	PDDG	6	586	3515	0.46	75.59	
56	TP0116	101	34	3418	0.45	76.04	Routine
57	TBCN0 17	49	69	3375	0.44	76.48	Bottle neck
58	HH031	586	6	3223	0.42	76.91	Routine
59	TB0156	290	11	3138	0.41	77.32	Routine
60	TB19	920	3	3136	0.41	77.73	Routine
61	TBT239	50	62	3077	0.40	78.14	Routine
62	TB1SN	850	4	3055	0.40	78.54	Routine
63	TBM3C	238	12	2864	0.38	78.92	Routine
64	TBH026	50	57	2846	0.37	79.29	Routine
65	TBK241	35	81	2827	0.37	79.66	Bottle neck
To- tal				60581 0			

Table 6: Vital items list