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PROJECT FORECASTING IN PROCUREMENT

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PROJEKTIEN ENNUSTAMINEN OSTOSSA

Tämän opinnäytetyön tavoitteena oli kehittää toimeksiantajayrityksen projektien ennustamista osto-osastolla. Tarkoituksena oli löytää tapoja, joilla projektien ennustettavuutta voitaisiin kehittää erityisesti oston näkökulmasta.

Tutkimus toteutettiin soveltamalla teoriaa toimeksiantajayrityksen tarpeisiin. Teoriaviitekehys käsittelee yrityksen liiketoiminnan ennustamisen perusperiaatteita sekä sen toteuttamiseen käytettäviä tapoja ja malleja. Tästä teoriaosuus etenee välillisesti ennustettavuutta tukeviin toimiin, joita ovat toimitusketjun ja toimittajasuhteiden hallinta sekä organisaation sisäinen ostastojen välinen yhteistyö ja tehostunut kommunikaatio.

Työn tuloksena laadittiin ehdotelma menetelmistä, jotka tukevat toimeksiantajayrityksen tavoitteita ja joita hyödyntämällä erityisesti toimeksiantajayrityksen osto-osasto pystyisi lisäämään toiminnan tehokkuutta.

Tutkimuksen myötä toimeksiantajayritys sai uusia näkökulmia toiminnan tehostamiseen. Työssä esille tuotujen menetelmien avulla eri toimintoihin ja toimittajiin käytetty työmäärä pysyy tarkoituksenmukaisena sekä selkeyttää tulevaa, mikä osaltaan edistää projektien ennustamista.

ASIASANAT:

Ennustaminen, toimittajasuhde, toimittajahallinta

BACHELOR´S THESIS | ABSTRACT

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PROJECT FORECASTING IN PROCUREMENT

The purpose of this thesis was to develop project forecasting in procurement for the case company. The objective was to find ways that would improve project forecasting especially in procurement's point of view.

The study was carried out by applying theory to the needs of the case company. The theory framework deals with the principals of business forecasting and the different methods of forecasting. After that, the theory framework continues to indirect ways that support forecasting, which include supply chain management and supplier relationship management and also internal cooperation between departments in the organization.

As a result of the work, a suggestion was formed about the methods that would support the goals and objectives of the case company and also increase the effectiveness of operations in procurement.

With this study the case company received new perspective for improving operations. With the methods presented in this work, time spent for different operations and suppliers will remain appropriate and the future will be clearer, which will enhance project forecasting.

KEYWORDS:

Forecasting, supplier relationship, supplier management

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1 INTRODUCTION

Forecasts are essential in setting goals and strategies for business. Forecasts are predictions of situations and outcomes that might occur in the future and would not be an important topic to consider if economy, markets, industries and prices were constant all the time. However, since business is constantly changing, there is a need to determine what those changes and their effects will be and how to counteract and overcome market conditions that have an effect on cost, profitability and competition. Forecasting is a strategic tool that supply management and procurement can use in order to remain cost effective, profitable and competitive. (Turner 2011, 121.)

1.1 The topic and background of this thesis

The topic of this thesis is project forecasting at a company that operates in shipbuilding industry. The case company provides full turnkey solutions for the marine and offshore industries and is a full-service contractor for new construction and modernization of cabins, wet units, public spaces, galleys, laundries, provision stores, refrigeration machinery and complete living quarters. The company needs forecasting in many phases of the projects: In the quotation phase the future costs for materials, transportation and labor costs must be forecasted as specifically as possible. The challenges in forecasting are long projects and the location of projects and suppliers, which can be basically all over the world. Forecasting is also needed in procurement and its different steps: To maximize the reliability of delivery, the company has to have forecasts for when the different steps of the process will occur. These steps include preparing a purchase request, making a purchase order, manufacturing and delivery. The longer manufacturing and delivery take, the earlier the process must be started.

This topic was chosen together with the case company's vice president of purchasing and estimation because of the need for development that was noted at the workplace and also the writer's interest on the topic. The most interesting topics while studying industrial management and engineering have been the topics related to purchasing, such as the significance of purchases to company's business operations and the importance of supplier relationship, strategic purchasing and supply chain management. The topic selected for this thesis is always current for procurement and is important for the

company because there is a lack of methods and procedures of project forecasting in procurement and therefore the opportunities for improvement are significant.

This research was carried out because the development of forecasting will bring cost savings and improve the reliability of delivery, which means that the materials are at the right place at the right time. It is important that in the quotation phase the future costs are already forecasted as accurately as possible in order the project to be profitable, which means that the eventual costs and revenue have the desired ratio. More requests for quotation are received all the time and the types and scopes of the projects vary greatly: Cabin types vary from standard cabins to suites and scopes vary from smaller projects to projects that include over a thousand cabins and thousands of square meters of public areas. To be able to succeed in the competition, it is important that the forecasts are accurate in order to succeed in the competition.

In addition, forecasting in different phases of procurement is a challenge because in the very early phases there should be forecasts of the timing for different steps in order to keep up with the schedule that has been agreed with the customer. Falling behind the schedule might in the worst case bring very expensive penalties whereas improving forecasting will help at avoiding penalties. A very important detail is to determine when the materials are actually needed and for that, many aspects need to be considered: How much engineering department needs time before they are able to make a purchase request, how much purchasing department needs time for discussion about the commercial matters with the supplier, how much time does the supplier need for manufacturing and how much time is needed for delivery. All these aspects can vary a lot depending on the product and the location.

1.2 The objective of the research

The challenges in this industry are caused by variation of the projects and because of that, traditional yearly budgeting, where x-percentage is added to the revenue of the previous year does not bring the desired benefit for forecasting. The goal of this thesis was to find tools and procedures to further develop the forecasting. This thesis discusses the basic theory of forecasting and the theory of how to improve both internal and external relationships in order to improve the predictability of the future, which will be followed by defining the current situation of forecasting in the company and finishing with suggestions for developing and improving forecasting and predictability in procurement as well as the possible effects on costs, profitability and competition. The objective of this research was to find new and better ways of forecasting for the project-based environment where the company operates. The research problem addresses the ways and methods project forecasting can be developed and procurement improved. The goal is that forecasting is more straightforward, business oriented and helps react promptly to the changes in the business environment.

1.3 Research methods

The research methods used in this thesis are qualitative. The theory part of business forecasting and special features of procurement were gathered from related literature. The relevance and applicability of the sources was ensured by concentrating on sources that are as recent as possible. The sources for the theory were all chosen considering the best methods for the case company. The needs of the case company were carefully evaluated and researched in order to be able to choose the most appropriate sources and also to define the limits for the topics that this research covers. The source of the current situation in the company consists of the information and the experience of the writer of this thesis and the other source of information is the case company's vice president of purchasing. This thesis introduces some improvement ideas in procurement point of view. One of the main themes for project forecasting in procurement in this research is the careful background work. For improving the basis before forecasting, some methods introduced were framework agreements and to determine with whom and for what products to make agreements, there was some theory of supplier relationship

management, and models such as VIPER and strategic supply wheel were introduced. For categorizing the product groups, the Kraljic matrix was introduced as an applicable tool.

The theory starts from defining forecasting and explaining why it is important for companies. The theory of forecasting also includes the themes of how forecasts are made, what are the steps in forecasting and also forecasting methods. After the introduction of forecasting, some ways of improving the basis for forecasting in procurement in order it to be more successful, are introduced. This part deals with supply chain management and some special features to take into account in shipbuilding industry. After the theory part, some current procedures of procurement are introduced and finally, some ideas of how to realize the theory in practice are presented. So this thesis ends with some improvement ideas for procurement, from which the company can possibly continue and further develop its operations.

2 THE BASIS FOR FORECASTING

Forecasting is an important tool for efficient planning. The objective of forecasting is to help at scheduling production, transportation and personnel and also to guide long-term strategic planning. It is predicting the future as accurately as possible using all the available information including both historical data and information of all the future events that might have an effect on business. The accuracy of a forecast depends on how well the contributing factors are understood and how much data there are on the topic. Every environment is changing and that is why a good forecast captures the way things move, not where things are. (Hyndman & Athanasopoulos 2018, 12–14.)

Depending on the application area, modern organizations tend to require short-term, medium-term and long-term forecasts for business. Short-term forecasts provide information for scheduling the personnel, production and transportation. Medium-term forecasts help at determining future resource requirements for raw material purchases, hiring personnel and buying machinery and equipment. Long-term forecasts support strategic planning and consider market opportunities, environmental factors and internal resources. There is also a wide range of forecasting methods from simple method, which can be using the most recent observation directly as a forecast to highly complex method, which can be an econometric system of simultaneous equations. The choice of method depends on the amount of data available and the predictability of an event. (Hyndman & Athanasopoulos 2018, 14–15.)

2.1 Making forecasts

A forecast is a statement about the future and therefore every event can be forecasted. Of course, there is no guarantee that the result will be anywhere near the forecast. A successful forecast method requires that there are regularities that can be captured, the regularities are informative about the future and the method captures those regularities but excludes non-regularities. However, capturing regularities and at the same time excluding non-regularities can be hard and the best forecasting method will be the one that balances these two the most successfully. (Castle, Clements & Hendry 2019, 21–22.)

There are some common and widely used forecasting methods: Guessing is a method based on pure luck and has fewest assumptions. “Rules of thumb” means using an

intuitive feeling when forecasting an event. Surveys of intentions and expectations can be helpful for forecasting, but they require that every responding individual reveals their plans accurately and there is always the risk that this is not the case. Simple forecasting models require the process to be quite regular without rapid changes. Formal forecasting systems require a lot of assumptions and therefore can go wrong, but they also combine information from progressive research and can help at explaining their own failures. (Castle, Clements & Hendry 2019, 22.)

2.1.1 Steps in forecasting

There are some basic steps that a forecasting process usually involves. The first and many times the most difficult step is to define the problem. This requires a good understanding of why the forecast will be used, who will use it and how the forecasting function fits within the organization that will use the forecast. The person creating the forecast needs to discuss with everyone involved in collecting data, maintaining databases and using the results of the forecast. The second step is to gather information and at least two kinds of information is required: statistical data and accumulated expertise of the people who will be collecting the data and also using the forecast. The third step is to make a preliminary analysis, which should be started by graphing the data and determining whether there are some consistent patterns or significant trend and are there some outliers in the data that need to be explained by those who obtain expert knowledge of the topic. The fourth step is to choose and fit the forecasting model, which can be for example regression model, exponential smoothing method or hierarchical forecasting. The best model for forecasting depends on the availability of historical data, the relationship and its strength between the forecast variable and explanatory variables as well as the way the forecast will be used. The last step after the forecasting model has been selected, is to use and evaluate the model. The performance of the model can be properly evaluated after the data for the forecast period is available. (Hyndman & Athanasopoulos 2018, 21–23.)

The object of the forecast is originally unknown, and it is called a random variable. Usually, the closer the forecasted event is, the less there is variation between the forecast and the actual result. When obtaining a forecast, the middle of the range of possible values for the random variable is estimated. Often there can be a prediction interval accompanied with a forecast, providing a range of values that the random variable could

have with relatively high probability. When talking about a forecast, it usually means the average value of the forecast distribution, which means the set of values that the random variable can take, along with the relative probabilities of these values. (Hyndman & Athanasopoulos 2018, 23–25.)

2.1.2 Forecasting methods

The appropriate forecasting method depend mainly on the available data. Quantitative forecasting methods can be used when there is numerical information from the past and it is reasonable to assume that some patterns from the past will continue into the future. Most of the quantitative prediction problems use either time series data, which are collected at regular intervals over time or cross-sectional data, which are collected at a single point in time. Qualitative forecasting methods must be used if there are no data available or the data available are not relevant. There are well-developed structured approaches for obtaining good forecasts without using historical data but after all, these methods are purely guesswork. (Hyndman & Athanasopoulos 2018, 16.)

2.1.3 Special features of shipbuilding industry

The building of complex and very highly customized ships can be referred to as a specific application of both resource-based and market-based concepts. In the resource-based view, the performance of a company is affected by company-specific resources and capabilities. This implies that the resources are allocated unevenly within an industry. Therefore, organizations must be aware of their strengths and weaknesses for them to be able to develop strategies on how to outperform competitors with their resources. The market-based view, on the other hand, focuses on the link between companies' strategies and their external environments. A basic assumption is that strategically relevant resources are distributed evenly within an industry. Additionally, in the shipbuilding industry, customers very strongly participate in the product specification processes and are part of value creation process. Therefore, companies increasingly become aware of the possibilities to differentiate from competitors, which can be obtained by offering value adding services, such as consumption saving solutions or manuals that reduce operating costs. In order to differentiate from competitors, the companies in the industry cannot solely rely on their technical core services but need also to take advantage of providing

some supplementary services. Technical core services represent company's outputs that customers are expecting. Supplementary technical services are for example the provision of consultancy work, spare-parts, training and on-site support. (Sauerhoff 2014, 7–15.)

2.2 Special features of business forecasting

Many organizations use the fixed annual budget as a performance forecast of revenues and expenses even though it is typically detached from business operations and strategic planning goals and therefore it fails to serve as an effective and dynamic business tool for many organizations. Conditions frequently change during a year and unanticipated risks arise, which prevents an organization from achieving its set goals. The fixed annual budget does not identify new risks due to its fixed and unchanging representation of business plan when the budget is being produced. This is problematic in a changing economic environment and a more flexible approach would allow for new risks to be identified and it would empower an organization to respond more effectively to those risks. (De Leon, Rafferty & Herschel 2011, 6.)

2.2.1 The aim of forecasting

According to Hyndman and Athanasopoulos (2018, 15), an organization needs a forecasting system that involves several approaches to predict uncertain events. Such forecasting systems require expertise in identifying problems in forecasting, applying different kind of forecasting methods, selecting different methods for different purposes and evaluating the methods over time. A strong organizational support is also important for the use of formal forecasting methods if they are to be applied successfully.

It is important to remember that forecasting does not by any means mean prophesy: It is not possible to predict future with absolute certainty. The focus of business forecasting is to systematically and rationally assemble information for the visibility of likely outcomes and potential risks. Effective forecasting is not about being genius, it requires hard work. More effective forecasting means that decisions are being informed better. This leads to a better chance that the business is conducted at the right time and avoiding doing things in a hurry saves a lot of time and resources, too. Improved forecasting also helps organizations at spotting discontinuities early, which improves the agility of the organization.

With better anticipating and quicker responding the organization will become more predictable and there are also some spin-off benefits: Good forecasting demands and therefore fosters effective teamwork and collaboration among the employees. (Morlidge & Player 2010, 39, 57.)

2.2.2 Rolling and event-based forecasting

Rolling forecasts and rolling budgets are often believed to be the most effective solutions from the many options that may improve traditional budgeting in an organization. Additionally, rolling forecasts can change temporal orientation of managers in various ways because when managers become skilled at preparing and interpreting rolling forecasts, they become more focused on detecting future changes in performance, rather than being concerned with explaining past performance. This is caused by an argument that rolling forecasts eliminates the “rear-view mirror” effect that results from controls that are based on budgeted numbers. As a result, rolling forecasts make planning and budgeting more forward looking and help at viewing planning as a continuous practice, instead of a top-down, annual event. (Gooderham, Kaarboe & Norreklit 2013, 154.)

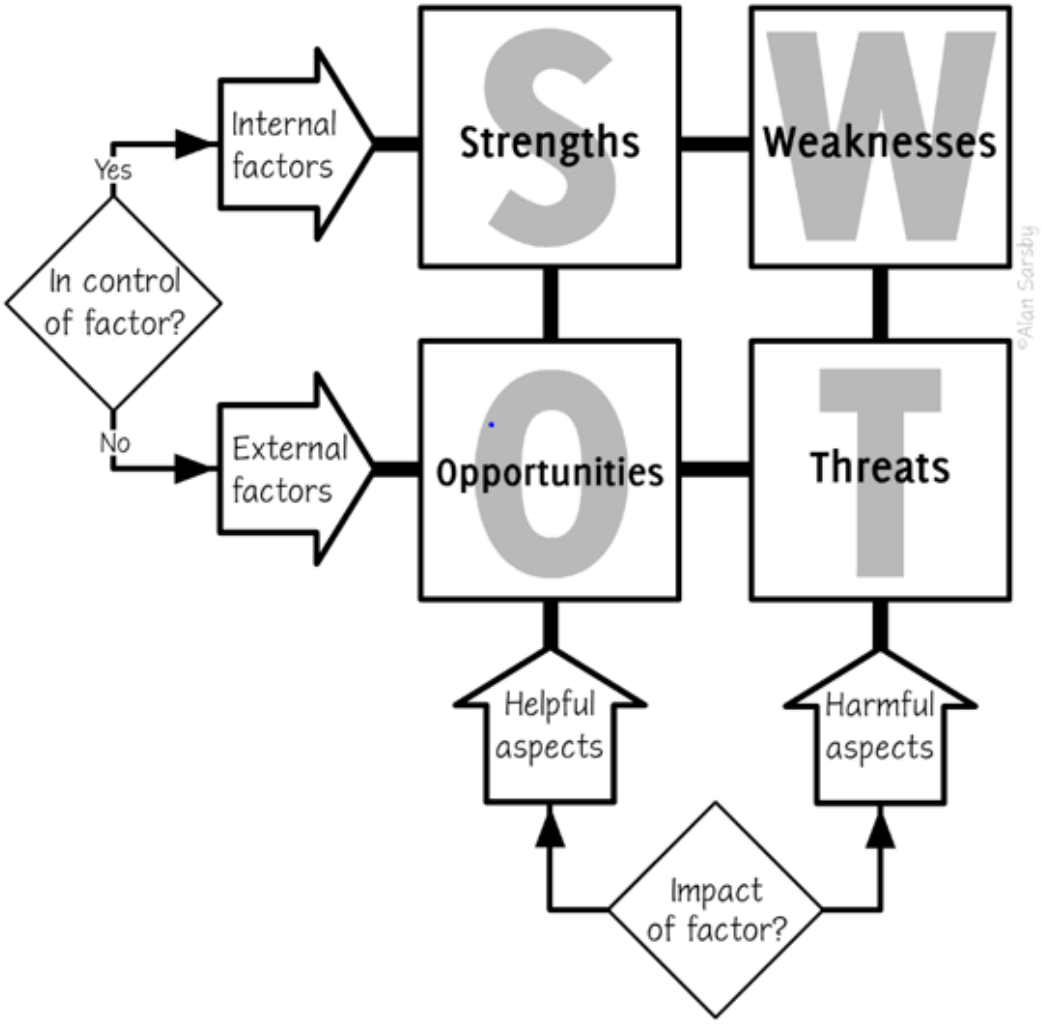
Event-based forecasting, on the other hand, works without a fixed frequency or time horizon and their use assumes that calendar time is not an adequate time horizon for internal business processes. Instead, what organizations should do, is to orient their processes to relevant events that occur in their business environment. Forecasting data should be able to flow into the systems according to their natural rhythms, which could be, for example, when a new competitor appears in the market. (Gooderham, Kaarboe & Norreklit 2013, 155).

2.2.3 Contingency plans

Even with very carefully completed forecasts, there are always some unexpected and unforeseen situations that can occur and impact on a forecast. It is therefore important to look at all of these situations that could have an impact and create contingency plans for them. This can be completed with a strengths, weaknesses, opportunities and threats analysis, a risk analysis and after that creating a mitigation and management plan to deal with the risks that were identified. Then a series of what if scenarios based on the risks and their mitigation plans can be performed to determine, which procedures have the

least number of risks and the best opportunity for overcoming problems. Additionally, a forecast of industry trends, future materials requirements and costs is reasonable, especially for specific project purchasing. Forecasting trends and materials requirements and costs is the core of practicing supply chain management and procurement successfully. (Turner 2011, 122.)

A strengths, weaknesses, opportunities and threats analysis, also known as SWOT analysis, is a popular strategy development framework. SWOT does not by itself lead to a strategy but is a tool for analysis and development. As Picture 1 shows, a SWOT diagram divides the factors into internal and external factors and helpful and harmful factors. Strengths are internal and helpful factors that support an opportunity or help at overcoming a threat. Strengths can be financial strengths, technological advantages, customer services or skilled and dedicated people. Weaknesses are internal and harmful factors that result in not being able to take an advantage of an opportunity or being vulnerable to a threat. Weaknesses might be financial weaknesses, old technology, poor customer service or shortages in skills. Opportunities are external and helpful factors which cannot be controlled but might be helpful. Opportunities can be new social trends, technological innovations or competitors withdrawing from the market. Threats are external and harmful factors that cannot be controlled. A threat can be a hostile takeover bit or potential loss of reputation. (Sarsby 2016, 3–10.)



Picture 1. The basic SWOT diagram (Sarsby 2016, 7).

2.3 Possibilities in supplier relationship management

One step where it would be important to improve forecasting, is the quotation phase. If the quotation phase can be made as standardized as possible, it would save a lot of time and money and also increase the accuracy. One way to ease and enhance the quotation phase would be increasing the number of framework agreements with suppliers remarkably. According to Albano and Nicholas (2016, 4–5), the main potential benefit brought by framework agreements is a reduction in transaction costs and time because some procedural steps such as advertising and assessing qualifications are already conducted and does not have to be completed individually for each purchase. Additionally, the procedural costs caused by framework agreements are aggregated over series of

purchases and the time to issue a purchase order is far shorter than in the case where every price and term is negotiated purchase by purchase.

2.3.1 Categorizing the suppliers

This part of the chapter describes different ways to classify both suppliers and purchases in order to determine strategically the most and least important ones and to determine the needed actions for different supplier and product groups.

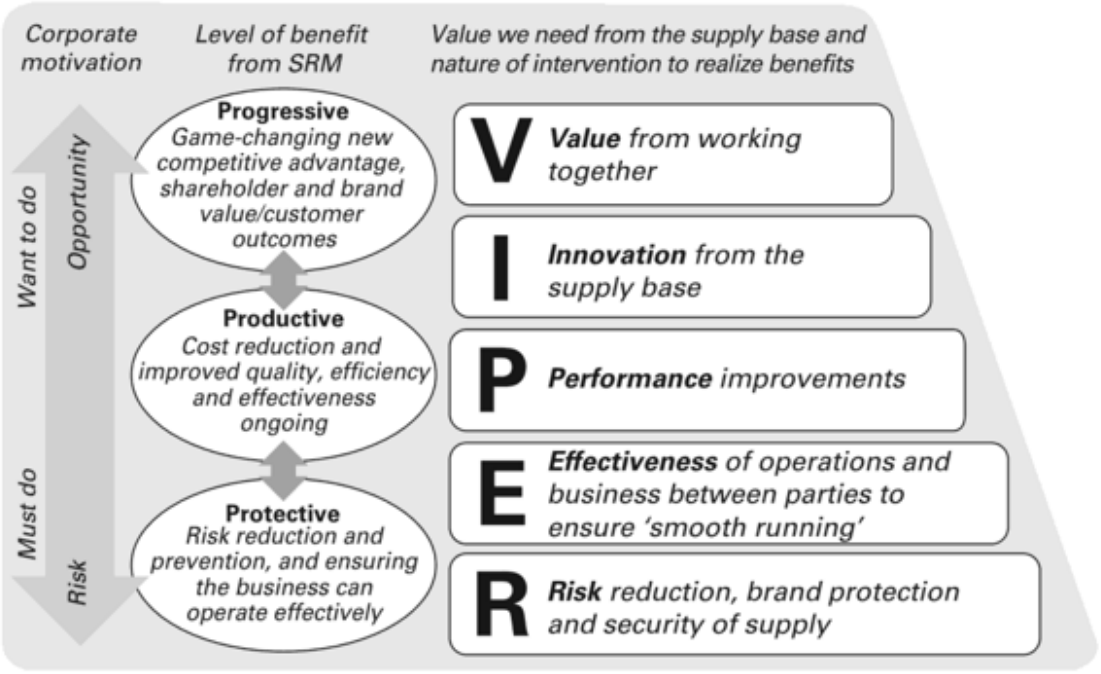
Supplier relationship management

Supplier relationship management is an approach that can provide competitive advantage, reduce costs, improve efficiency and reduce supply side risk. It is an organization-wide philosophy that everyone in the organization needs to embrace in order for it to deliver those benefits. Since purchasing is usually the main interface with the external parties from which it sources, supplier relationship management is often viewed as purchasing-led. However, for it to contribute effectively to organizational success it requires cross-functional participation in the organization. If supplier relationship management is intended to have a significant impact, it must be an integral component in the way the company connects its sourcing with the way it satisfies the end customers and the overarching strategy of the company. The relationship between these three, sourcing, satisfying customers and strategy, is fundamental if an organization wants to gain competitive advantage by capitalizing the potential from the supply base. Without this the initiative might not be much more than some great ideas by well-meaning purchasers that end up making just little significant difference. The key to achieve the convergence in practice is understanding the way value flows into and through organization and on to the end customer. (O'Brien 2014, 38–40).

Organizations need contribution, clarity, confidence, closeness and collaboration from the suppliers and therefore the right relationships with the right suppliers are needed in order to gain benefits. 'Let's collaborate more with suppliers' and 'We need innovation from the supply base' are easy to say but if there is no clear purpose for them, they are just directionless aims. The starting place of supplier relationship management is to determine the direction, which starts with the organization's needs. The specific reasons of why the company needs a relationship with certain suppliers are needed and what additional value the company is trying to secure. After that, the company can begin to

determine what the required relationship should look like and with whom it should be created. One point to keep in mind is that the company cannot have a relationship with every supplier and many suppliers simply need to provide what is needed, on time, in full to agreed price. With some suppliers some form of intervention might be necessary to keep everything in track and in some cases, it might bring much greater value, which can make a dramatic contribution for the business. Picture 2 shows a VIPER model, which has five headings that define what is possible from the supply base. Those are the five reasons to be closer to the supplier and to build a relationship. (O'Brien 2014, 18–19).

VIPER is a model that can be used to determine the value the organization wants from the supplier base. It stands for value, innovation, performance effectiveness and risk. The most critical reason for supply base intervention is managing supplier and supply chain risk effectively. Risk forms the foundation of the VIPER preventing or at least being prepared for a crisis is arguably the greatest source of value that can be secured from the supply base. The second reason for an intervention with a supplier and searching for supply chain value is effective running of the business. This applies to operations that require ongoing communication with the supplier and in these cases the relationship becomes essential for the operations to run effectively. The third reason for an intervention with suppliers is performance and its improvement. Supplier performance includes many areas such as quality, timeliness, correctness, price and risk management. The effort to drive improvement in supplier performance is worthwhile when the company can gain or lose significantly, the intervention will likely bring results, there are no alternative suppliers so this needs to work or the supplier is unable to improve without help. The fourth reason for an intervention is innovation, which can for example improve the brand, differentiation or market share. The ultimate reason for a supplier relationship is the additional value, which is possible to reach with the suppliers that have capability to help the organization to achieve its corporate goals. (O'Brien 2014, 19–29).



Picture 2. The VIPER model (O'Brien 2018, 22).

Strategic supply wheel

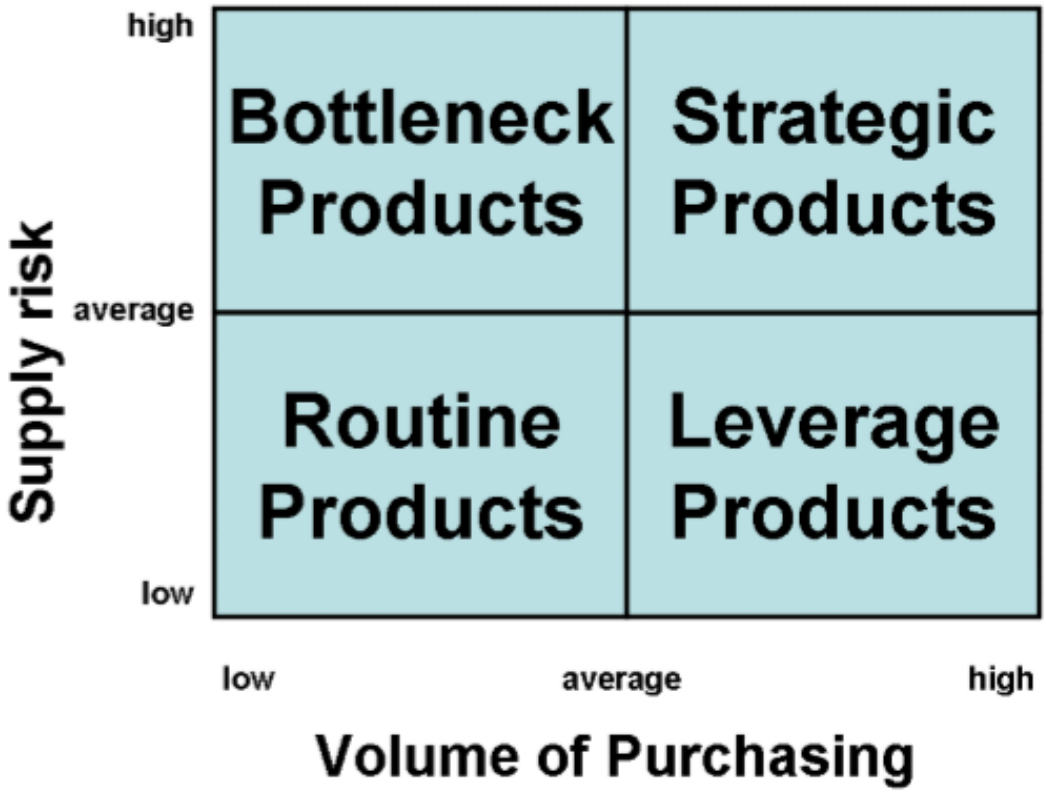
According to Cousins, Lamming, Lawson and Squire (2008, 5–6), a supply wheel can be used as a framework when discussing the main issues regarding the supply chain. The supply wheel explains the main principles and concepts of supply management and brings together the key areas for consideration in strategic supply management. As Picture 3 shows, each of the elements are interrelated and at the center of the model is corporate and supply strategy, which holds the wheel together. Without it the whole wheel would fall apart. The model indicates that the level of alignment and strategic thinking affects all elements of the model so for example, with a great strategy but without the people to deliver it, the strategy is worthless. According to the supply wheel the key elements of supply management are performance measurement, skills and competences, organizational structure, relationship portfolios and cost-benefit modelling.

Picture 3. The strategic supply wheel (Cousins, Lamming, Lawson and Squire 2008, 5).

2.3.2 Categorizing the purchases

Kraljic matrix

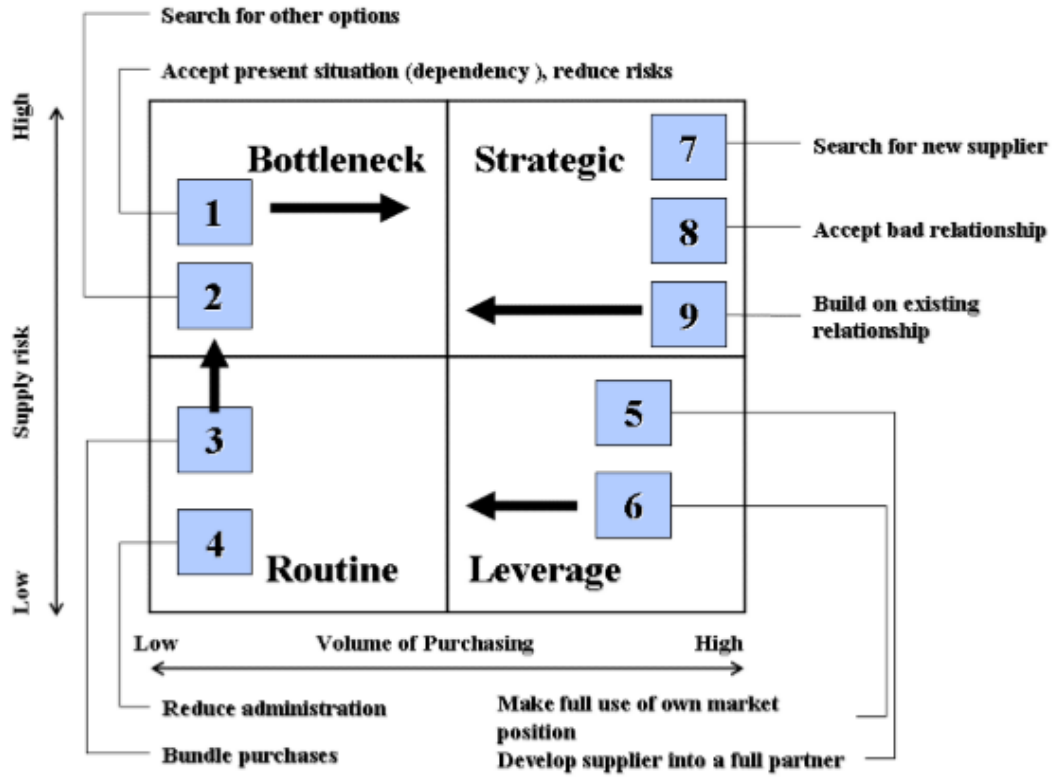
Kraljic matrix is a tool to classify the items to be purchased according to the supply risk and the volume of purchasing. Picture 4 shows a matrix with four fields, where vertically from bottom to top increases the supply risk and horizontally from left to right increases the volume of purchasing. The supply risk includes elements such as possible sources, situations of monopolies and oligopolies, speed of progress in technology, obstacles for new suppliers to enter the market, costs of logistics and complexity of the product. The volume and importance of purchasing is determined by aspects such as costs of material, total costs of production, added value and profitability. These aspects classify purchases into four different categories that are routine, leverage, bottleneck and strategic products. (Glöckner 2005, 3.)



Picture 4. Kraljic matrix (Glöckner 2005, 3).

Routine products are usually commodities and some specific materials that have abundant supply, which means that there are a lot of possible suppliers in the market. Therefore, the agreements for routine products should be made for a maximum of one year since there is a lot of competition and the prices should be checked at least once a year. Similarly to routine products, leverage products have a low supply risk because they have an abundant supply. However, these products have higher volume of purchasing and the main indicators for the products are cost and material flow. The agreements are usually completed for one to two-year time frame. Bottleneck products have a high supply risk, but the volume of purchasing is quite low. These are mainly specified materials that have only few possible suppliers. The key performance indicators are cost management and reliable short-term sourcing of global and new suppliers with new and innovative technology. Strategic products have both high supply risk and high volume of purchasing. Usually there are only few possible suppliers for the products and the products might be specifically designed for the buying company. The key performance indicator for strategic products is long-term availability and agreements are long, even up to ten

years. (Glöckner 2005, 4.) Picture 5 represents the recommended purchasing actions for different product categories.



Picture 5. Purchase Strategies in Portfolio (Glöckner 2005, 8).

2.3.3 Risk management in supply chain

Risk management is a process that that aims to help organizations understand, evaluate and take action on all the potential risks and increase the probability of the success and reduce the likelihood of failure. The four main activities of risk management are understanding what kind of failures can occur, preventing them occurring, minimizing the negative consequences of failures and recovering failures when they occur. There are many causes for operations failure, which include design failure, facilities failure, staff failure, supplier failure, customer failure and also environmental disruption. The three ways of measuring a failure are failure rates that indicate how often a failure is likely to occur, reliability that measures the chances for a failure to occur and availability that is the amount of available operating time left after taking account of failures. Risk mitigation means isolating a failure from the negative consequences and those actions include

mitigation planning, economic mitigation, containment, loss reduction and substitution. Recovering from the effects of a failure can be enhanced by a systematic approach to discovering the cause of failure, acting to inform, finding the root cause of a failure and preventing it to take place again. (Slack, Chambers & Johnston 2010, 596–597).

2.4 Internal indicators of performance

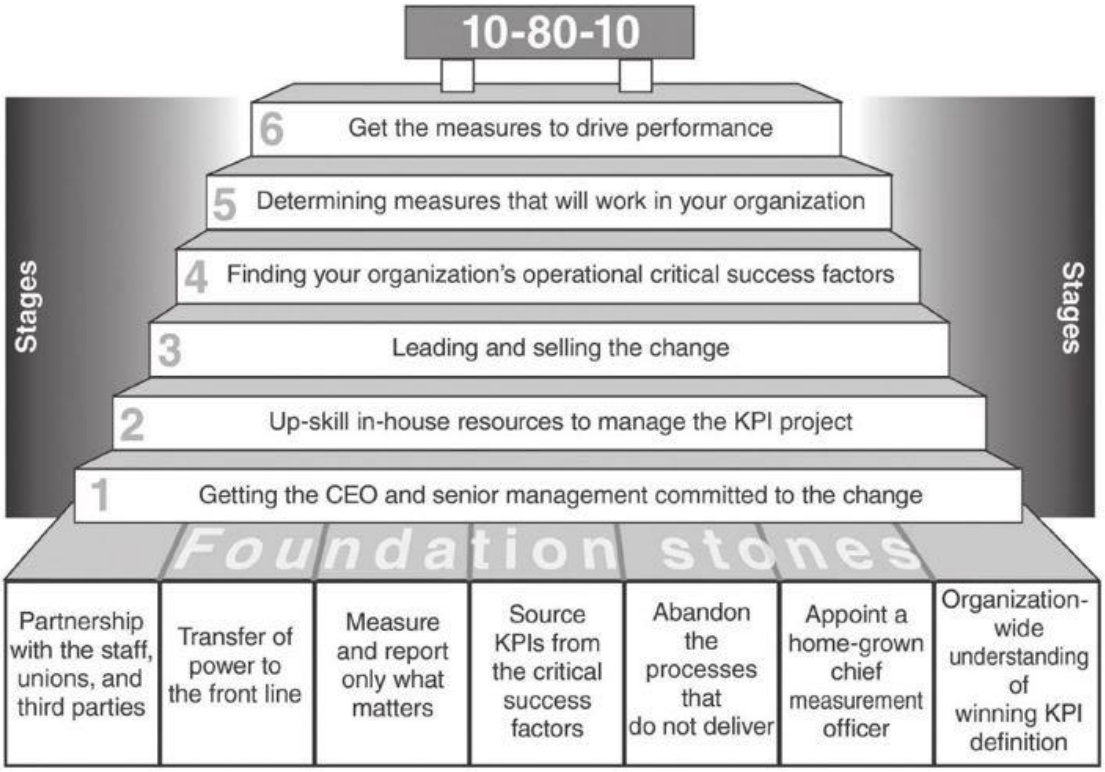
This part of the chapter deals with methods and indicators that are important for developing the performance internally in the organization.

2.4.1 Key performance indicators

Key performance indicators represent a set of measures that focus on the aspects of organizational performance that are the most critical for the current and future success. Key performance indicators should be monitored daily or weekly, a monthly or more rarely monitored measurement cannot be a key to the business. KPIs are current- or future-oriented measures, unlike most organizational measures that are past indicators measuring events of the last month or quarter. That kind of indicators cannot be KPIs. Additionally, KPIs are nonfinancial measures and they cannot be expressed in dollars or euros. (Parmenter 2010, 4–9.)

Picture 6 shows the seven foundation stones that need to be laid before the key performance indicators can successfully be developed and utilized in the organization. The presence or absence of these seven foundations stones determines the success or the failure of the KPI process. They are so important that without them only limited success will be achieved. The first foundation stone for a successful KPI is partnership with the staff, unions and third parties, which include major customers and major suppliers. The second foundation that a successful performance improvement requires is transferring power to the front line, which means effective two-way communication, empowerment of the employees and devolving responsibility. The third foundation stone is that only matters that are vital are being measured and reported. The fourth foundation for a successful KPI is sourcing KPIs from the critical success factors because the primary role of performance measures is to help workforce focus on the critical success factors, which are more fundamental to an organization than its strategic initiatives. The fifth foundation is abandoning the processes that do not deliver, which can mean abandoning

performance measures, reports, meetings or projects. The sixth foundation stone is appointing a home-grown chief measurement officer, which means appointing someone a full-time responsibility of leading a KPI team. The seventh foundation for a successful KPI is an organization-wide understanding of winning KPI definition. (Parmenter 2015, 107–117.)



Picture 6. The Seven Foundation Stones in the Winning KPI Methodology (Parmenter 2015, 108).

2.4.2 Internal alignment

A primary operating principle in procurement is the work that an organization needs to do internally before starting discussions with the supply base. This step is often ignored or not focused on sufficiently and the downside is that procurement might be sourcing supplies that are not fully right, focusing on wrong supplies, wasting supplier's time and losing credibility both internally and externally. To avoid these, it is important for procurement professionals to be closely aligned with their peers in the supply chain because without that it will be very hard to know what to buy and what opportunities in the market

are the most valid. This alignment is achieved at a number of stages, times and levels: Business plan alignment requires annual business planning and review cycle between business unit management and procurement leadership and alignment around specific business objectives requires cross-functional operation of a project team. This alignment requires the procurement professionals to be able to identify potential levers for alignment and spotting business needs, service focus to direct the effort on peer needs and ability to sell ideas through participation, not using the authority or position. As a conclusion, procurement professionals need to align horizontally with the business and also vertically with the management, which results in internal alignment that is achieved in an interrelation between supply chain, the business and the board. (Mena, van Hoek & Christopher 2018, 29–31.)

3 CURRENT SITUATION

This chapter deals with forecasting at the company currently. The chapter describes the steps that are at the moment being used for forecasting at different phases of the projects. This chapter will also cover certain aspects where there are opportunities to make further improvements. The information in this chapter is mainly gathered by working in the case company's purchasing department and being part of project teams and seeing in practice how everything works internally in procurement and also between departments. Many of the themes mentioned in this chapter have been topics of conversation at the workplace with coworkers and they were especially discussed with the vice president of purchasing and estimation in terms of this research.

3.1 Forecasting in the company

In the shipbuilding industry where the business is project based, it is quite difficult to use a certain forecasting method. This is not because there is no available data because there is a lot of numerical and other information from the past. The problem is, since the types and scopes of projects vary so much, that it is not completely reasonable to assume that the patterns from the past will be similar in the future. For example, for a certain type of store that sells certain types of products, it is easier to assume that they will sell more or less the same amount as last year at the same time of the year. In the shipbuilding industry, on the other hand, it is not certain what kind of projects there will be in the future. Of course, the management closely follows the trends in the industry and in that way will have an idea of what kind of projects the company will quote for in the near future.

When forecasting, it is also very important to take into account the effects of the environment: What is the situation in the market where the company operates and what is the situation of the company among its competitors. Market defines whether or not there is demand for what the company offers, and competitors indicate whether or not there are other companies that are trying to win the same projects. Estimating these two factors is a basis for further forecasting because they are factors that are out of the company's control but have a significant impact on the company and how many new projects it will receive.

The company has a table of forecasted hot projects, which shows all the “hot” projects, i.e. the projects whose contractors will be determined soon. This table shows all the projects that the company will quote for and an estimated timing when the contractor of the project will be resolved. This table does not show an exact percentage of how probable it is to receive a contract for each project in the table, but the probability of receiving the project is over 50 when it is in the table of forecasted hot projects. The table also shows an estimated sales value for the project and what the contract would include, for example cabins, public areas, corridors etc. In this stage also the travelling and the logistics budget per project are being estimated.

A detailed forecasting system has many benfits: One of the main areas to forecast are timing and scheduling of different steps of the project, since those are the basis for a successful execution of a project. Another important aspect, which can be improved with successful forecasting, is costs of the project, because when future costs are being forecasted correctly, the desired level of profit can be reached. Additionally, with a detailed forecast, the number of employees can be set at a right level since it is already known how many hours of design, planning, purchasing, project management etc. will be needed. The company has already a detailed system to forecast upcoming projects and their budgets. With the current forecasting system, the costs for a project are estimated in detail in advance and the potential subcontractors and suppliers are determined before starting the project. A good anticipation is about managing risks that might occur during a project, and the steps to a careful anticipation will be described more specifically in the chapter 3.2.

3.2 Supplier relationship management in procurement

The case company has numerous different suppliers for numerous different products that are being purchased. The suppliers and products vary greatly from project to project but there are some suppliers and products that are used frequently for most of the projects. With many of the frequently used suppliers, the case company already has agreements for product prices and delivery times and terms. On the other hand, in each project there are also a lot of purchases for which the purchasing process needs to be started by sourcing for an appropriate supplier. The case company has a global sourcing manager, whose job is to source for new suppliers in Europe, Asia and Canada, but also purchasers need to do sourcing in their work. Sourcing for a local supplier for a specific

project is needed especially when a project is in a further location and the logistics costs would be too high if the supplies were transported from Finland.

Currently, before starting a new project, the vendor manager from procurement issues an installation plan together with site manager and sourcing manager. With an installation plan, the vendor manager confirms the work scopes, execution type, schedule and requirements of the project. In the installation plan the potential subcontractors are always selected from the approved and pre-qualified subcontractor and supplier pool, which is created by the sourcing manager. Before adding to the pool, each subcontractor and supplier has to go through the pre-qualification process, which includes pre-qualification questionnaire, cashflow check, non-disclosure agreement and a visit to their premises. This is done to ensure that the best and most cost effective subcontractors and suppliers are selected to bidding process. Project planner fills and updates the installation work schedule, which is used in subcontractor inquiries and agreements in order to ensure that the project schedule is correct for the agreed work scopes.

The pool of suppliers and subcontractors for selected geographical locations is created based on a forecast, which shows the geographical locations of all the potential projects. The geographical locations of the sourcing pool are Europe, Asia and Canada and each of the location has a specific target number for every subcontracting and material supplier category. At the moment the case company has 34 spend categories for subcontracting and material suppliers and 6 main subcontracting categories cover 85% of all forecasted subcontracting spend and 8 main product categories cover 90% of all forecasted material spend.

To ensure that installation work is according to the forecasted budget, every subcontracted work has been divided into separate works with own budgets and order numbers in a cost calculation sheet. After every two-week period, subcontractor fills a milestone payment certificate with cumulative progress in percentage and cumulative cost in euros. The milestone payment certificate is accepted by the site manager of the case company. Only correctly filled and signed milestone payment certificates are accepted. It is a responsibility of a vendor manager to fill the milestone information to cost calculation sheet. The budger follow-up tracker shows instantly, if the progress versus cost is under or over the budget in euros. Extra works, which are not included in the original scope of work, are handled in a separate extra work list. The case company confirms the used extra hours with the yard and after that the case company will compensate the used extra works to subcontractor.

To ensure that material purchases are made correctly according to the schedule, a procurement tracker is created before starting the project. The goal is that purchases are not late and every needed item will be purchased. The reason why the procurement tracker is made before starting the project is that everything needs to be planned in advance when there is still time. Instead of including every single item on separate rows, the procurement tracker includes product groups, such as doors, wet units, wall panels, ceiling panels etc. Project planner starts filling the tracker by adding the date when certain products are needed on site. The planned date for the purchase order can be determined by diminishing the time needed for transportation and the lead time of the product from the date when the products are needed on site. The date when the engineering department needs to hand the purchase request for procurement is usually two weeks before the planned purchase order date. Vendor manager and project engineer go through the procurement tracker once a week to see the progress and if everything is on schedule. With this tracker, the work can be done proactively and it is easy to check whether everything that is needed has been purchased.

The company has already started to increase the number of framework agreements with suppliers. The objective is that 95% of all the purchases have contract coverage and 80% have a framework agreement. Making framework agreements brings benefits for multiple departments of the company: The sales will create quotations faster since there are already agreed prices for different kind of products and services, which means that less research is required when starting to count an offer. The procurement, on the other hand, will manage the purchasing process faster since the process does not start from the beginning with every single purchase. Occasionally it can be a lengthy process from sending purchase requests for multiple vendors, negotiating prices and delivery and payment terms to actually placing the purchase order. With framework agreements, a lot of valuable time can be saved. Luckily, the company already has framework agreements with many frequently used suppliers with whom the purchasing volume is significant.

For most purchases the company has the specific suppliers that it uses continuously but developing supplier relationships is not always very systematic at the case company and the purchasers do not have clear instructions regarding supplier relationships. These frequently used suppliers could be segmented and categorized to determine the possibilities in the supply base and determine the suppliers with whom a close relationship would be beneficial. For this the VIPER model can be used. It gives five reasons to be closer to the supplier and those reasons are value, innovation, performance, efficiency

and risk reduction. When discussing the main issues in the supply chain, a supply wheel can be used. It brings together the main concepts in the supply chain management, which are performance measurement, skills and competences, organizational structure, relationship portfolios and cost-benefit modelling. In the heart of the wheel there is corporate and supply strategy, which holds the wheel together.

In addition to categorizing the suppliers, the same could be applied to different products. Kraljic matrix shares the products into four different groups according to the purchasing volume and the supply risk. The four product groups are routine, leverage, bottleneck and strategic products. After categorizing the products into these groups, the company can form different kind of strategies for the different groups. This would be helpful for the company because it is not worth the effort to create a partnership with a supplier whose products belong to leverage product category. Furthermore, after categorizing the products, the purchasing department could internally be organized according to the product groups, when one purchaser could concentrate on the special features of a certain group more deeply. These would make dividing tasks easier and improve the efficiency in procurement. Within a product group monitoring and tracking the market would become easier and the competitive tendering between suppliers and products would also be emphasized and highlighted.

3.3 Internally used performance indicators

The company has already agreed key performance indicators for procurement. The actions that the company could take in order to make sure that the KPIs are successful are ensuring that they are monitored at least weekly, they are all current- or future-oriented and all of the measures are non-financial. Additionally, for a successful utilization of the indicators, the company should check that the seven foundations for a successful KPI are all laid because without them only limited success will be achieved with KPIs. Currently, the purchasers in the operational level do not have daily or even weekly KPIs in use and after questioning other purchaser of the case company, it was clear that the current KPIs for procurement are not familiar for the purchasers working at the operational level.

Internal alignment is an area where the company already pays attention to but there is still room for improvement. Enhancing internal alignment in the company would be very important for procurement to be able to operate more efficiently. In this company, the

purchase requests arrive from engineering department and especially the communication between procurement and engineering should be improved to be even more efficient and clearer in order to avoid sourcing supplies that are not fully right, and in that way, wasting valuable time. The greatest challenges are that neither purchasers nor suppliers fully understand the requirements of purchase requests and what is truly needed and also long response times when asking more specifications from engineering. This leads to the fact that the purchasers are not able to place purchase orders in time and therefore the supplied items arrive late in the shipyards. This is a significant issue and falling behind the schedule might have very expensive consequences.

Project planners have important tasks at estimating the dates when the items are required on site. If lead time and delivery time for the item is known, the date when engineering needs to hand out the purchase request can be determined. To be able to follow the schedule, the purchase request needs to be clear enough to purchasers for them to be able to proceed with the requests for quotations and afterwards with the purchase orders. For this schedule to be visible for everyone, procurement, planning and engineering have created a procurement tracker. This includes all the important dates that need to be followed and it provides a clear sight of important dates but does not remove the other great issue, which is that many times it is unclear what exactly is needed and excessive time is being spent to determine this.

4 IMPROVEMENT IDEAS

As a result of this thesis, some improvement ideas were developed in order to create a better basis for more efficient project forecasting in procurement through supply chain management, supplier relationship management, framework agreements and internal alignment in the organization. The objective is that with a more efficient project forecasting, a more detailed course of a project will be known in advance and that way there is a greater probability of cost savings, high reliability of the deliveries and timeliness in procurement.

4.1 Improving the basis for forecasting

As a result of the research, a number of improvement ideas were introduced for procurement. Those ideas will create a basis that will lead to a more accurate project forecasting in procurement. The core idea consisted of enhanced supplier relationship management and especially paying more attention into evaluating and categorizing the suppliers in order to determine the appropriate level of relationship with them. In addition to supply chain management, another aspect to pay more attention to, was internal alignment in the organization.

From the beginning of the theory part of this thesis it can be seen that traditional methods of business forecasting cannot be easily applied to project-based business environment. Using purely mathematical formulas and quantitative methods does not bring the desired results in an environment that has such high variation. For this reason, company specific applications are needed, and qualitative methods are to be used.

4.1.1 Applicable forecasting methods

The case company should start the forecasting process by dividing forecasts into short-term, medium-term and long-term forecasts. Short-term forecasts are the ones providing information for scheduling the personnel, medium-term forecasts are those helping at determining future resource requirements for raw material purchases and hiring personnel and long-term forecasts are the ones supporting strategic planning and considering market opportunities, environmental factors and internal resources. For each type of

forecast, a forecasting process needs to be established. The steps to be followed in practice in a forecasting process are defining the problem, gathering information, making a preliminary analysis, choosing and fitting the forecasting model and finally, evaluating the model. By following these steps, forecasting will be more effective, and it will bring the best and closest possible results. More effective forecasting also means that decisions are being informed better, which leads to a better chance that right measures are taken at the right time and avoiding doing things in a hurry saves a lot of time and resources as well. Improving forecasting as adviced, the case company will spot discontinuities early, which improves the agility of the organization and with better anticipating and quicker responding the organization, in this case especially procurement, will become more predictable.

Since this company is project oriented and the projects vary from year to year, rolling and event-based forecasting might be considerable options for forecasting in procurement. The purchases vary greatly from project to project and accurate forecasts are impossible to be made before knowing the type and the scope of a project. Especially event-based forecasting supports the project organization: A natural flow of forecasting is when the company receives a new project and starts planning and estimating the costs. At this step, having framework agreements with different suppliers, helps for this phase to be as smooth and fluent as possible since every price does not have to be requested separately.

For the case company the aim of improved forecasting is to support both operative processes and management, so the goal is to develop the concept of forecasting and its management process. This deals especially with processes in operational organization level. The information from the forecasts must be understandable for both management and operational levels, so that everyone in the organization understands the information in the forecasts and what kind of actions are needed. The aim is also to create a more flexible planning since traditional budgeting is not flexible enough for a project organization where the number and type of projects vary greatly yearly. Therefore, forecasting needs to be performance based, which means focusing on the characteristics that are most relevant for the industry in question. This is something to be noted when applying new methods.

4.1.2 Supplier relationship management

Improving supplier relationship management should be a systematic and persistent process applied to appropriate suppliers. According to VIPER model risk reduction, brand protection and security of supply are the minimum requirements for an active supplier relationship. If the minimum requirements are met and the relationship is working as expected, the relationship can be deepened step by step. The condition for deepening any relationship is that the effort is seen to be worthwhile and the benefits that the company receives from spending time and money for creating a relationship are greater than the losses of spending valuable resources. The actions needed in practice from the case company are determining step by step, what can be achieved with a certain supplier. If the case company is able to reach innovation and value from a supplier, a progressive relationship that brings game-changing new competitive advantage should be established.

Relationship with a supplier should be analyzed and improved using categorizing by Kraljic matrix. Kraljic matrix helps at determining the nature of a supplier relationship according to the purchasing volume and the supply risk of the supplier's product. Supplier relationship should be cherished with those suppliers whose products are strategic for the purchasing company. On the other hand, it is not worthwhile placing great effort creating a relationship with a supplier whose products are routine products for the purchasing company. To begin with Kraljic matrix in practice, the company should determine the supply risk and purchasing volume for different products. After that, the products are divided into bottleneck, leverage, routine and strategic products and action plans for different categories should be created. For example, the higher the supply risk for a product, the more active relationship should be established with the supplier of the product.

Risk management in the case company should be proactive and it should include acknowledging, preventing and preparing for the consequences of occurring risks. Since there are both internal and external risks, the proposed development for the case company's risk management is to categorize risks according to their types because the actions taken depend on how much the company is able to affect. If there is a risk within the organization, it is easier to make an action plan for it in comparison to a risk that is purely related to a supplier or a customer, for instance. Risk mitigation plan should be established for the most critical risks that would have major consequences for business if they occurred. In practice, a risk mitigation plan for the major risks includes determining

how to isolate a failure from the negative consequences and those actions include mitigation planning, economic mitigation, containment, loss reduction and substitution.

4.1.3 Internal performance indicators

Key performance indicators in procurement should be checked in order to ensure that those indicators indeed are the most valid KPIs for procurement. It is also important to inform the KPIs to those working at operational level, which is not the case at the company currently because KPIs are used as management's tools. Bringing KPIs to those working at operational level would increase the efficiency of tracking KPIs and also the benefits gained would be potentially greater. The foundation for a successful KPI also needs to be checked and if there is deficiency in any of the foundations, corrective actions need to be made.

Internal alignment within a project team would bring remarkable benefits in many aspects, also in the anticipation and forecasting of the project. Since the project teams are large and include many different departments, the improvement starts from clearly informing and communicating everyone's roles and responsibilities. After that, internal alignment is created and developed by an improved flow of information within a project team and providing positive feedback when everything runs according to the plans. By increasing the team spirit of a project team, everyone would be more committed to work for common goals and the communication would be clearer and more straightforward, which would make it easier to anticipate and forecast projects in procurement. In addition to the benefits from procurement's side of view, the other departments would undeniably also benefit from a better cooperation between the departments.

4.2 Further development areas

Within an organization, improving one area often brings some indirect benefits in other areas, too. For the most parts, the focus of this thesis was in the indirect ways of improving project forecasting in procurement. There are endless ways of improving operations and processes, which would bring some clarity of the future among other benefits brought by them. This thesis covered the impacts of supplier relationship management and internal alignment in the organization, but it left out one major party, which includes the customers. For a further development, applying some analyzing and categorizing

methods to customers could bring some clarity to the future and help at anticipating and forecasting it.

5 CONCLUSION

The objective of this thesis was to develop methods to improve project forecasting at a company that operates in shipbuilding industry. The purpose was to find tools that would result in a better cost estimation and better scheduling. The goal was that these tools would bring cost savings, enhance the processes through a better base work and preparation and also help at scheduling so that business is completed at the right place at the right time.

This work was carried out by dividing it into three different steps: The first step was to search for basic theory and principles of business forecasting and why it is needed. The theory part also included some other methods that would result in a more efficient forecasting, among other benefits. The second step was to assess the current state of forecasting at the company and describe why this topic is so critical for the company. The final step was to apply the theory of business forecasting, supplier relationship management and internal performance indicators for the applicable and suitable parts for the company's needs and that way improve project forecasting.

The challenge of this work was to find ways to apply the theory of business forecasting with this company because of all the special features of the industry in question. The problem with all the ready-made forecasting formulas is the basic assumption that the patterns from the past will continue in the future, which in this case is not fully true because of the variation of the projects under work. For this reason, the theory could not be directly applied to the company's use because it would not have brought the desired outcomes. It is also to be noted that for this work, there are no right or wrong answers about what the case company should do, and this work presented some tools that could support at progressing to the right and desired direction.

As a result of this work, some ideas from the theory were applied for the applicable parts, to respond the needs of this specific company. This resulted in recommendations of how to improve project forecasting especially in procurement. These improvements, when the employees are committed to apply the methods correctly, would result in cost savings, time savings and rise the reliability of the deliveries remarkably. One of the main factors for the implementation of these methods to be successful and to bring the desired outcomes, is the alignment of the employees, especially horizontally. The reason for this is that procurement, for instance, needs information from engineering and planning for it to

be able to operate correctly, so even though procurement is fully committed to improve their work, the desired results will not be reached without the alignment of others, too. That is why the commitment of the employees is a precondition for any of the new methods to work in practice.

It is important to take into consideration that this work is solely addressed to the case company in question. Therefore, the methods recommended for this company may not bring the desired outcomes when applied similarly to another company. It is also important to note that a number of formulas that were informed to be more or less useless for this company's needs, might be useful for another one. The critique is not directed at the formula itself but its applicability for this specific company's needs.

This research brings significant information and knowledge of new ways of operating and can be utilized for the development of project forecasting in procurement. The methods presented in this research are intended to make purchasers' work more efficient since more agreements are made with the suppliers and the timetables are known in detail. The more in detail the course of a project can be forecasted at the beginning of the project, the more efficient work will be completed in terms of cost savings and spending time in matters that are important. Based on this research, these methods can be further developed, or totally new methods can be created aside of them to make project forecasting in procurement even more efficient.

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