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LOG950 Logistics

Performance evaluation of purchasing and supply management using balanced scorecard

Tatsiana Karalkova

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SUMMARY

Recognizing the growing importance of purchasing operations combined with cost reduction problems that production companies are facing today, the managers need a tool for purchasing performance evaluation. This is especially relevant for manufacturing companies when their performance is highly depended on the successful fulfilment of purchasing management because purchasing costs have high percentage in sales revenues.

The balanced scorecard (BSC) system has often been recommended as a tool for measurement and control of supply chain management, and rarely for specific functional areas like, for example, purchasing processes.

The main aim of this paper is to adopt BSC methodology to purchasing operations and supply management of a case study company, which operates in engineer to order (ETO) logistic environment.

The suggested in the thesis BSC has been adopted to purchasing performance evaluation of the case company. It is based on comprehensive review of literature on purchasing and supply management performance evaluation and the data obtained from the case company.

According to the BSC approach, after determining the mission, vision, and strategy of a certain company, company's objectives should be defined and applicable set of key performance indicators (KPIs) has to be developed in a balanced way.

BSC system adopted to purchasing and supply management operations can provide a practical guidance for company's managers in measuring and evaluating of operations in respective areas from five perspectives: finance, customer, supplier, internal business process, and learning and growth.

The BSC suggested in this paper can help managers to evaluate purchasing and supply management in accordance with the company's strategy. Furthermore, the developed model can be useful for purchasing performance evaluation of other companies which operate in ETO production system.

Finally, P-BSC tool can help companies to monitor and control their purchasing and supply operations and facilitate decision-making. Therefore, it can be a good theoretical approach for practical appraisals in purchasing and supply management area.

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List of abbreviations

BSC – Balanced Scorecard

P-BSC – Purchasing Balanced Scorecard

R&D – Research and development

LNG – Liquefied natural gas

ETO – Engineer to order

JIT – Just-in-time

ERP – Enterprise resource planning

KPI – Key performance indicator

SWOT – Strengths, weaknesses, opportunities and threats

CAPS – Center for Advanced Purchasing Studies

IT – Information technology

HSE – Health, safety and the environment

NORSOK – Norsk Sokkels Konkuranseposisjon

ROI – Return on investment

ECS – External customer satisfaction

ICS – Internal customer satisfaction

WTE – Whole-time equivalent

INTRODUCTION

The relevance of chosen topic, the main aim of the study, research objectives and brief description of the thesis content are presented in introduction section.

1.1 Relevance of the thesis

Today in the era of information systems, competing supply chains and the increased role of the end-customer needs satisfaction managers need a set of financial and non-financial indicators that provide valuable support for successful decision-making in different functional areas in which purchasing operations are one of the most important.

Purchasing and supply management becomes increasingly more important to senior management of a company due to its impact on operational performance and on financial outcomes. However, cross-functional nature of some purchasing and supply management activities can lead to inadequate data collection and mixed results of performance measurement. This is a weak side of current performance evaluation methodologies that are used by companies today (Saranga and Moser 2010).

Kaplan and Norton (1992) introduced the method of performance evaluation named as a balanced scorecard (BSC). This method combines financial, customer, internal processes and organizational learning and growth perspectives. The BSC involves financial and non-financial indicators, leading and lagging measures, short term and long term objectives, internal and external performance perspectives.

Since 1992 this method has been widely used by different organizations as a powerful tool that helps companies to evaluate performance by using a set of KPIs. Moreover BSC provides a foundation for evaluation of company's strategies and management system. In most of the cases, the BSC is used by companies only as a measurement tool but not as a management system.

From the practical point of view one of the most complicated problems for managers is the evaluation of purchasing performance. Some managers have argued that purchasing performance is based on many activities which are difficult to evaluate due to their intangible nature.

Van Weele (2014) claims that a comprehensive performance measurement system in purchasing contributes to monitoring of effectiveness as well as efficiency and facilitates the decision-making for purchasing managers.

An efficient purchasing performance can lead to a range of benefits for companies including cost reduction, quality improvement, lead-time reduction, improving payment terms, increased market share and sales, creation of long-term customer relationships, etc. The choice and the usage of a proper performance evaluation tool have a big impact on reaching company's strategic goals which leads to further improvements in the overall business process of the company.

This explains practical and scientific interest of the performance evaluation of purchasing and supply management by using BSC approach.

1.2 Aim of the study and research objectives

To focus on the mentioned above issues, we formulated the main aim of current research as following: to adopt BSC methodology to purchasing operations and supply management of a case study company, which operates in ETO logistic environment.

In order to achieve the aim of this paper we have formulated the following research objectives:

- Review the literature in purchasing and supply management performance evaluation in order to identify measurements of efficiency and effectiveness of company's purchasing operations.
- Explain the concept of BSC and advantages of this tool with regard to purchasing and supply management performance evaluation.
- Determine KPIs for purchasing performance of a case company and establish their cause and effect relationships. The set of KPIs should be matched in a balance way.
- Explain findings and provide recommendations for improving of company's purchasing operations and supply management.

Following these research objectives, the analysis of scientific literature has to be conducted along with close cooperation with the research object (case company).

1.3 Structure of the thesis

The structure of this thesis is organized as follows:

Chapter 2 presents case company profile description and research problem definition. The literature review of the performance evaluation of purchasing and supply management by using BSC is provided in Chapter 3. Chapter 4 is devoted to methodological problems of development of BSC for company's purchasing operations. Research methodology of current thesis including research process structure, method of study and data collection are described in Chapter 5. Practical part of the thesis consists of data analysis and the development of P-BSC as a performance evaluation tool for purchasing and supply management operations of Midsund Bruk AS. Chapter 6 and 7 are devoted to the analytical part of the thesis. Summary of findings and the discussion section are presented in Chapter 8. Finally, conclusions and limitations with suggestions for future research are presented in Chapter 9 and Chapter 10 respectively.

2. COMPANY PROFILE AND RESEARCH PROBLEM

In this thesis Midsund Bruk AS was selected as a case study company. There are several reasons of this choice.

First of all, Midsund Bruk is a manufacturing company and a leading supplier of high-tech pressure vessels to the market with the experience for more than 40 years. The company is a leading one in the industry of the region. Its financial success is important to the region's economy.

The second reason is that Midsund Bruk offers design, engineering, and manufactures its products in accordance with customer requirements. The company focuses on customer adapted solutions of the project, quality of the end product, on-time delivery within agreed budget.

Finally, the volume and nomenclature of purchased materials are varied from one of the company's project to another. For the company it is vital to control the quantity, quality and the price of delivered materials, and the time of delivery. These factors have an impact on the fulfillment of the company's contract obligations and, therefore, the end customer satisfaction.

2.1 History of the company

Midsund Bruk is a Norwegian manufacturing company that supplies to the market a high-tech pressure vessels and steel constructions. The company was founded in 1973 by Aukra Bruk, with the main purpose of production of steel constructions for ships. In 1979 Midsund Bruk diversified its production and started to fabricate pressure vessels for offshore and onshore industry. The first contract within oil and gas industry the company won in 1985. According to that contract Midsund Bruk had to design, produce and deliver pressure tanks to Gullfaks and Oseberg. The next significant contract for the company was won in 1990 with Hustadmarmor on the delivery of storage tanks (Midsund Bruk 2015a).

Historically the owner of Midsund Bruk was changed several times. In 2002 Aker Yards acquired Midsund Bruk from Aukra Bruk. Then in 2004 Aker Invest II acquired Midsund Bruk from Aker Yards. And in 2009 Aker Solutions AS acquired Midsund Bruk from Aker Invest II. In 2010 the company was renamed to Aker Midsund, and in 2014 – the company was re-branded to its original name, Midsund Bruk (Fjords Processing 2015).

Since 1973 Midsund Bruk has earned a good reputation in its market. The pressure vessels and storage tanks, produced by the company were highly demanded. As a consequence, the decision to invest in a new facilities of the company with the purpose to increase total production volume and companies' profit was taken in 2007 (Midsund Bruk 2015a).

This heavy investments program fostered the production and delivery of a new product as a storage tank for liquefied natural gas (LNG). In 2009 Midsund Bruk was recognized as the first Norwegian company producing LNG storage tanks (Midsund Bruk 2010).

Therefore, this historical overview of the company shows that the company is successfully growing by developing a new production technology, investing in new facilities, expanding assortment of products, increasing the number of customers and production volumes.

2.2 General information about the company

Midsund Bruk is located on the northwestern coast of Norway, named Midsund (approximately 30 km west of Molde) in a cluster with offshore industry suppliers. The company has a production facilities with a total production area of 8000 m^2 (Midsund Bruk 2015a).

Midsund Bruk is well known as a company offering design, engineering, project management and manufacturing of high quality products (Midsund Bruk 2015b). The company produces the following products:

- pressure vessels, separators, scrubbers, slug catchers, coalesces, degassers, dehydrators, ect.;
- storage tanks for chemicals, water or calcium carbonate, ect.;
- LNG storage tanks;
- steel constructions (anchor packages, pedestals, winch drums, etc.);
- subsea equipment (pressure vessels for subsea applications, subsea separation of oil and gas).

Midsund Bruk provides also services, related to the company's core business, such as: repairs, modifications, retrofit engineering, inspection and supervision, etc. (Midsund Bruk 2015c).

Today more than 80 experienced employees (engineers, high skilled workers and administrative personal) are working at the company.

Midsund Bruk is 100 % owned by Aker (Midsund Bruk 2015a).

The main customers of the company are from offshore, onshore, chemical, and process industries.

During the interview with company's purchasing manager we found out that Midsund Bruk delivers their products to the local market in Norway as well as to the European market. The company's key customers in Norway are: Statoil, Aker Solutions, Omaya Hustadmarmor. The main customers in Europe are: BP Global (United Kingdom), Maersk Group (Denmark).

According to the information obtained from the interview, the company's competitors in Norway are: AMOF AS (Molde), Fabricom AS (Stavanger). In this competitive environment one of the strengths of the company is well established partnership between Midsund Bruk and Statoil. The main projects on design, engineer and manufacturing are ordered by Statoil.

The company's managers emphasize on the following competitive advantages of Midsund Bruk:

1. *On time delivery*. Midsund Bruk has positive reputation on the market for its on time delivery. Moreover, the company has a know-how after 30 years of experience in the oil and gas industry (Midsund Bruk 2015b).
2. *High quality of products*. The company has a new and "state of the art" manufacturing equipment that allows to produce large steel pressure vessels and high tensile steel grades with a high quality. Since1994 Certified Quality Assurance System ISO-9001-2008 has been implemented in Midsund Bruk. Today the high quality products and services is a trademark of the company (Midsund Bruk 2015b).
3. *Competitive price in the North-Sea area*. Competitive price for the company's product is provided by the location of Midsund Bruk that is closer to the market than its competitors. According to the information obtained at the interview with purchasing manager of the company, the transportation cost for central European manufacturers comprise 20% of Midsund Bruk total costs.

Therefore, the company is focusing on offering customer adopted solutions including clients' complex project specifications and requirements. It means that the company is

dealing with a highly customized product. Considering company's production policy, Midsund Bruk operates in ETO logistic environment.

General information about Midsund Bruk AS, which is disclosed in the current section of the paper provides the background for the problem definition.

2.3 Problem definition

The research area of the thesis is the purchasing operations and supply management.

The relevance of control and monitoring of purchasing operations and supply management of companies is supported by increasing amount of debates in industries and academic circles about this topic. Taking into account that purchasing operations have a major effect on company's performance, company's managers need to evaluate their purchasing performance by the means of effective performance measures and metrics.

Nowadays Midsund Bruk AS is rightly considered to be a "leading high-tech pressure vessel supplier" (the company's slogan). Moreover, as it was mentioned in the section 2.1 the company is successfully growing.

During the discussions with purchasing manager of the company it was clarified that the company's strategic goal was to be the best pressure vessel supplier in the Eastern Europe. For the company it means to deliver the agreed product or service at the right time, in accordance with customer's project specific requirements (high quality product) and at agreed price.

As it has been mentioned above, the core business of the company is design, engineering and manufacturing pressure vessels, storage tanks and steel constrictions. According to the information that we have got from the interview with company's purchasing manager, the lead-time between placing an order (project) and product delivery to the end customer is approximately 6 months. In addition to that, the company has to deliver the product to the customer on-time and within agreed budget. The lead-time for delivery of some purchased materials can be up to 5 months. Taking into consideration the mentioned above factors, purchasing operations are the key company's performance drivers.

For the company any delay in purchasing operations or shortages of materials, or delay of delivery is very risky. It can lead to high final costs for the company. If production lead-time is out of the project schedule, it may negatively impact on the fulfillment of contract obligations and, as a consequence, damage the company's reputation and reduce

the number of clients. This also contradicts to the company's strategy to be a leading pressure vessel supplier in the Eastern Europe.

It should be noted from the interview with purchasing manager that one of the major companies' expenses is purchasing costs, which on an average accounts for 60-70 % of a company's total project costs.

All mentioned above factors explain the significance of purchasing process and its impact on effectiveness and efficiency indicators of the case study company, Midsund Bruk.

The problem is that the company is lacking of effective system of performance evaluation of its purchasing operations and supply management in order to monitor purchasing performance and to improve decision-making in the relative area.

We suggest to adopt the BSC to the company's performance evaluation in purchasing and supply management. By applying BSC approach, we can focus on non-financial performance measures as well as financial indicators. Non-financial indicators help to measure intangible assets and capabilities of the company, and enable to evaluate the performance of purchasing and supply management in a comprehensive way. Moreover, BSC approach contributes to balancing of all performance indicators in accordance with considered perspectives.

Therefore, from the practical point of view the purpose of this study contributes to the improvements in purchasing operations and supply management of a certain company. From the theoretical point of view, the suggested BSC approach can be a good tool for the performance evaluation of purchasing operations for other companies which operate in ETO production environment.

2.4 Research questions

In order to find a solution to the above mentioned problem and achieve the aim of this study we need to answer to the following research questions:

Q1: Why and how purchasing and supply management performance of a certain company should be evaluated?

Q2: Why BSC may be considered as the best option for purchasing performance evaluation?

Q3: How to develop P-BSC for the company which has an ETO production system?

Q3.1: What is the company's vision, mission and strategy?

Q3.2: Which KPIs are relevant to the company's strategy?

Q3.3: How the developed BSC system evaluates company's purchasing and supply management performance?

Q4: How to improve purchasing operations and supply management by applying P-BSC methodology?

The necessity of using BSC and theoretical framework of the performance evaluation of purchasing and supply management will be discussed in the following chapter 3.

3. LITERATURE REVIEW

This part of thesis involves literature review on the main theoretical frameworks used in this thesis. First, we will examine the importance of purchasing as a part of business process and provide an explanation to purchasing activities. Second, we cover the framework of purchasing performance evaluation. And finally we describe the main characteristics and elements of the BSC concept, its advantages and nuances of adoption to purchasing environment.

3.1 Purchasing and its role for manufacturing industry

In this section we show the importance of purchasing within an organization.

3.1.1 Purchasing as a part of business process

Purchasing plays an important role in the business processes of manufacturing companies. According to van Weele (2014) an analysis of the cost structure of manufacturing companies shows that the average purchasing costs consist of 60-80 % of the cost of goods sold or sales revenues.

Today the notion of purchasing has a different meaning in practice as well as in the literature. In order to avoid misunderstandings regarding this term we can use the following definition: *"Purchasing is the management of the company's external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured at the most favorable conditions"* (van Weele 2014, 8).

In many companies, purchasing function has evolved from service function to strategic function. Purchasing department, as any other business unit of an organization, should support the achievement of the company's strategic goals. On the Figure 1 the position of the purchasing department in the strategic map of an organization is shown. The corporate strategy is supported by the strategies of all other departments having their own goals and KPIs. Strategies, goals and KPIs of each department must strongly support the corporate strategy but not focus solely on their own targets (Jones and Oliver 2006).

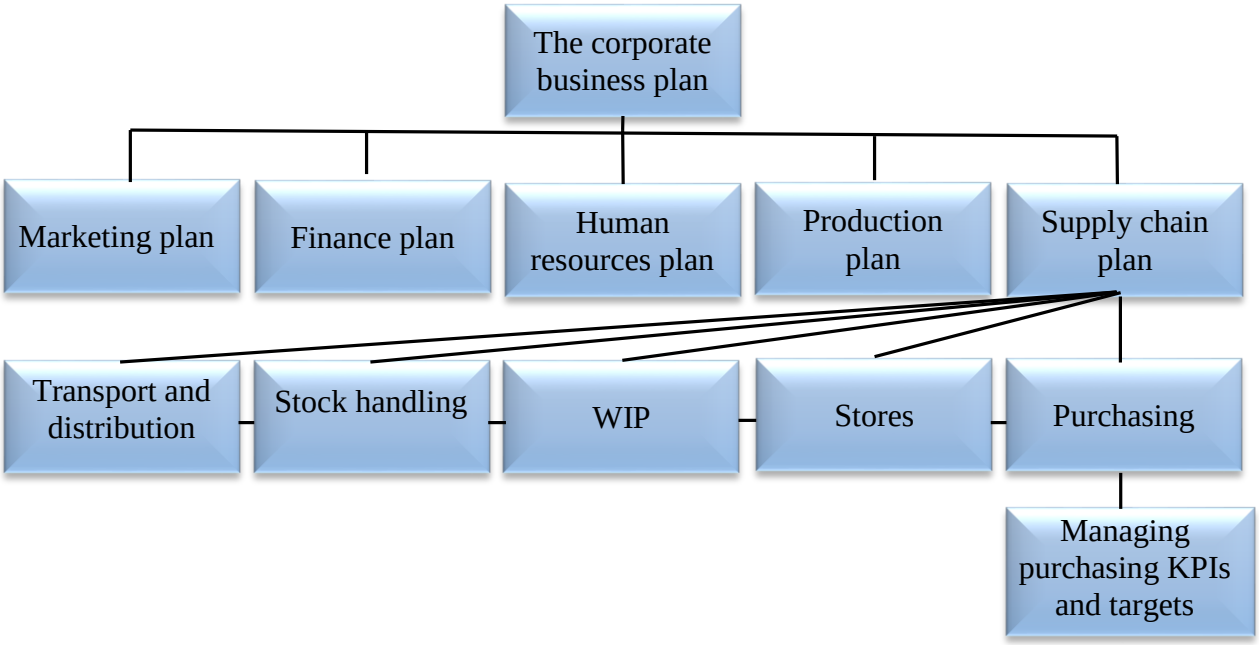

Figure 1: Purchasing position in corporate business plan (Source: redrawn from Jones and Oliver 2006).

Furthermore, the strategy and purchasing goals should not only support the company's vision but should also reflect the top management's perception and attitude towards purchasing department (Farmer and van Weele 1995).

Van Weele (2014) defines the following primary tasks inherent to purchasing function at any company:

- Operational excellence. This task deals with effective and efficient supply. The main task of purchasing is to provide secure supply of the required (by the internal customer) goods and services of the agreed quality at a reasonable cost or price. Ensuring constant availability of goods and services.
- Reduction of purchasing related costs. This relates to organizing the supply in the most efficient way. Purchasing task here is to reduce indirect costs related to logistics and material handling (transportation costs, safety stocks, quality inspections etc.). Of course, when reducing these costs, the related ricks are to be weighted up since the reckless cost reduction may lead to disruption of the supply process.
- Risk management. This basically relates to the company's risks associated with supply markets. The company should reduce the risk of becoming too dependent of its suppliers. It must ensure that it always has an access to reliable suppliers which provide high quality and on time delivery. Therefore, excessive reduction of supplier base may lead to the situation when a company is taken captive by just a few suppliers.

- Continuous improvement. This relates to purchasing development, i.e. how a company revises and implements new products and processes associated with purchasing.

Each company should clearly state each purchasing policy both internally and externally. Purchasing management is responsible for advocating the company's needs, actions and visions with respect to supplier. For better understanding of the above mentioned purchasing tasks, a purchasing process model would be a good support for purchasing managers (Knoppen and Sáenz 2015).

There are several important things are left to clarify for the conclusion. The first is that irrespective of the importance of the purchasing and supply management for an organization, it remains a support process. The purchasing and supply management enables a company to define and cooperate with the best suppliers. It may help to reduce logistics costs, define innovate technologies and attract suppliers into new product research and development (R&D) field. Nevertheless, it is not entirely responsible for strategic results (Ellram et al. 2002).

Another point to mention is that the measures of purchasing and supply activities' success should be strongly linked to their performance. Implementation of some of the best practices requires that selected performance measures must incorporate the relevant metrics. And it should worth of mentioning that financial outcome of some changes implementation may appear in several years. Furthermore, incorporation of the best practices should be done not only within purchasing but as well should be integrated within other areas of a company (Carter et al. 2005). In the following sections all these implications will be covered in a more detailed way.

3.1.2 Purchasing process

The purchasing process in organizations is commonly divided into six steeps or phases. The first step involves identification of the need or specification. The final step which is continuous, represents the evaluation of suppliers and follow up of the executed purchase. The steps in between are organized in such a way that the company receives the right product or service of the needed quality from a qualified supplier within the required time and at the lowest cost. The steps of the purchasing process are shown in the Figure 2.

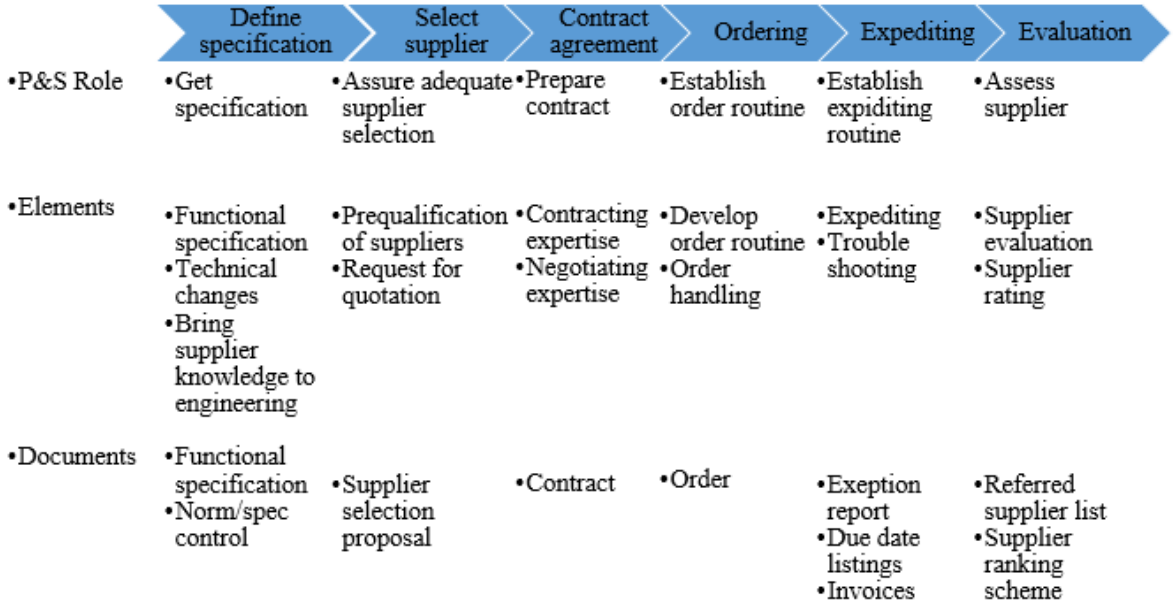

Figure 2: Purchasing process (Source: adapted from van Weele 2014).

From the Figure 2 we see that the first step is to define specification that describes properties of the ordered products and defines some activities to be provided by potential supplier. The next step is to select the relevant for the purchase supplier. This procedure involves all activities which are necessary for selection of the best supplier: supplier search, preliminary assessment of suppliers, preparation of bidders list, possible subcontracting, creation of the request for quotation, analysis of the received bids and finally selection of the supplier. Then follows contracting phase which depends on whether the selected supplier is new or not. If the selected supplier is a new one, then negotiating process and discussion of terms and conditions of the contract may take a lot of time. If the buyer deals with the existing supplier, contractual phase may be omitted. The contracting phase is followed by ordering. The ordering involves placing purchase orders in accordance with contract terms and conditions. Expediting phase is associated with the ensuring of the order fulfillment is in accordance with the internal customer's requirements and agreements concluded with suppliers. This involves provision of all necessary documentation, ensuring (if possible) the quality of goods and services before delivery is made or service is done. Post-delivery expediting deals with checking the quality of products, registration of delivery times or delays etc. The final steep of the purchasing process is the evaluation of the supplier and follow-up, that includes updating information on the supplier performance and adjustment of its rank in the company's list of suppliers.

3.1.3 Purchasing in ETO companies: features and challenges

ETO production process is triggered by a customer's order that initiates the purchase of the required materials and encompasses all activities from design to assembly Van Weele (2014). The ETO is characterized by production on multipurpose machine tools by highly skilled employees. Commonly, unsignificant production quantities of various types of parts are involved in the process. It is obvious that specificity of manufacturing process in this case leads to differences in purchasing and supply activities between organizations within ETO industry. ETO production process is shown on Figure 3.

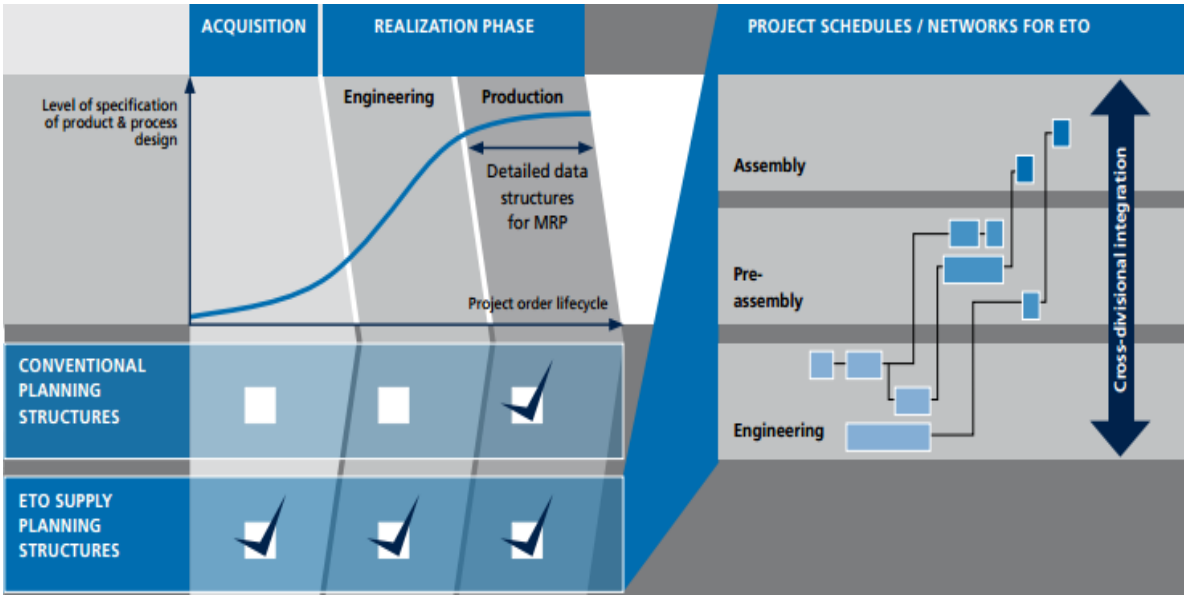

Figure 3: Main steps of the Engineer to Order (ETO) Process (Source: Camelot ItLab 2015)

The ETO process involves two main phases: acquisition phase and realization phase. Acquisition involves gathering reliable information from engineering, purchasing and production departments. *Realization phase* includes *engineering* activities (engineering of the ordered product) which create the basis for purchasing of the required materials and subsequent production.

The common challenges of ETO manufacturing involve:

- ✓ Today's Enterprise Resource Planning (ERP) systems' capabilities do not support planning requirements of ETO manufacturing throughout the project lifecycle.
- ✓ The planning processes and organizational structures are oriented on a specific product and therefore efficient management on the operational level is complicated.

- ✓ Almost non achievable project planning synchronization throughout the project order lifecycle (from acquisition to production).
- ✓ Innovative IT solutions for managing project complexity are often not found.

Arabe (2005) describes the features of purchasing and supply in the companies with ETO production approach and emphasizes its inherent problems. The author claims that in ETO firms vital role in the project belongs to engineers and designers because after an order is placed with the company, engineers in ETO firms start working on the design and material specification. During design and engineering quantities in the bill of materials are often corrected. For this reason designers and engineers are cautious to release incomplete specifications to purchasing. On the other hand, they cannot submit complete specifications or bill of materials due to time pressure. Hence, the engineering department quite often provides partial bills of materials within several days or weeks, creating obstacles to efficiencies. The longer the engineering process takes, the less time for contracting and negotiations the purchasing department has.

Hicks et al. (2000) emphasize that customized and often complex products, large variety of work and market uncertainties show that marketing, purchasing and supply functions should be integrated with other business processes and especially with design and tendering. Such specificity of the ETO imposes constraints on the application of traditional methods of purchasing and supply management. Thus, purchasing and supply function, from the strategic point of view, is of great importance in ETO manufacturing and may significantly contribute to tendering and early product development activities and therefore has a potential for performance improvement.

In ETO companies purchasing decisions are analyzed both form strategic and operational perspectives. Here, the processes of tendering, design and contract management, which are non-physical, are supposed to be core capabilities. This means that more attention is used to be paid to product features and capability than to design for assembly or manufacture. This, in turn, leads to cost increase and excessive range of components. Here, incorporation of standardization for the design change along with understanding the product development process creates good possibilities for costs reduction and managing design.

Gunasekaran (1999) has made an attempt to characterize the purchasing operations in companies, which operate in ETO logistic environment, through the prism of just-in-time (JIT) approach. The author states that in an ETO manufacturing, the purchasing process is supposed to be customer driven and it should possess the elements of JIT purchasing. In this case, materials are supplied to the business units at the time when they need it. A coordinated

cooperation between the supplier and the purchaser is required to ensure a good work of such system ensuring continuous flow from the row materials to the delivery of the finished product. The concept has the following features (Gunasekaran 1999):

- limited number of suppliers
- close collaboration between buyers and suppliers
- well established long-term partnerships
- small order size
- high extent of order control
- supplier location is close to the company-buyer

Here, the main problem represents the lack of communication between the business units involved in the process (Gunasekaran 1999). Since the ETO purchasing does not entirely corresponds to JIT-purchasing, some extra challenges are encountered, e.g. inability to order materials prior to knowing the customer's demand and this of course influences the ETO company and suppliers if materials and components.

Jahnukainen and Lahti (1999) found out that in the companies with ETO production approach the share of purchased components of the product costs is 70-80%. It means that an efficient purchasing is essential for companies, which operates in ETO environment. The ways for efficient purchasing for such companies are:

- Suppliers control as own manufacturing
- Additional arrangements for critical parts and components
- Applying to repeatability of the projects and the capability of the suppliers

Jahnukainen and Lahti (1999) mention that the supplier capability in ETO purchasing can be better utilized by creating the sourcing structure, sourcing policy clarification and fostering the cooperation and integration of the operations.

3.2 Performance evaluation in purchasing

The function of purchasing and supply chain management is no longer considered as a service function. It became strategic, value-adding function and is able to impact both on top and bottom line of an organization (Chen et al. 2004). Measurement of purchasing performance plays a vital role in the activity of any organization where purchasing is a part of business process. Costs reduction of services and row materials, and innovation in cooperation with suppliers put companies into stronger position in the market place relative

their competitors (Das and Narasimhan 2000). Performance measurement systems is supposed to provide the purchasing executives and top management with the information and data on how purchasing adds value to the organization (Saranga and Moser 2010). In this section we discuss the benefits, some potential drawbacks in purchasing and supply performance evaluation, and how actually performance is assessed.

3.2.1 Benefits and potential problems related to supply performance evaluation

Basically, most of existing literature in purchasing area refers to the book of van Weele (2014, 2010 and 2005) and earlier editions, where this topic is thoroughly examined. Van Weele (2014, 2010) summarizes the benefits of a systematic purchasing performance evaluation in the following statements:

- Purchasing performance evaluation contributes to better decision-making for purchasing managers since it helps to identify and analyze the variances from the planned results, find out their cause-and-effect relationships and prevent an occurrence of negative effect in the future.
- It creates better communication with other departments (for example, design and planning department, financial department) and helps them in resources planning, production scheduling and regulation of payment operations.
- It provides clarity to buyer-supplier relationships. Regular reporting of actual results versus planned allows a buyer to realize whether their expectations and goals achieved or not. This provides valuable information to the buyer and contributes to the assessment of purchasing department performance.
- It may lead to better motivation: well-designed system of purchasing performance evaluation may facilitate to the purchasing managers' satisfaction of personal needs.

Just to sum up the implications of the above mentioned advantages Carter et al. (2005) indicate that the effective system of purchasing performance evaluation contributes to better sourcing decisions, time savings, cost reduction, lower price for purchased goods, better communication with supplier, lesser number of rejects of incoming materials, etc. And finally it enables top management to assess the contribution of the purchasing function to overall financial performance.

From the theoretical and practical point of view there are some difficulties related with purchasing performance evaluation that van Weele (2014, 2010) defines as following:

- Differences in definitions of purchasing concepts. Such terms as purchasing and procurement; purchasing efficiency, purchasing effectiveness and purchasing performance sometimes are used in practice and in theory as interchangeable.
- Unclearly defined purchasing objectives and strategies. Many companies have realized the importance of purchasing aims and strategies but can not clearly define them. As a consequence, it's difficult to distinguish key performance measurements in purchasing and objectively evaluate the performance of company's purchasing management.
- Lack of accuracy in measurements. Purchasing performance evaluation includes financial measurements as well as non-financial. The last one has intangible nature and therefore is difficult to measure.
- Lack of single approach for purchasing performance evaluation. Purchasing strategy, tasks and responsibilities vary from one company to another that precludes using one and the same system of purchasing performance measurements.
- The lack of clear input-output relationships. This significantly limits the ability of measuring and evaluation of purchasing activities.

3.2.2 Assessment of purchasing performance

The extensive review of literature on performance measurement in purchasing shows that there is no unique approach to the purchasing performance evaluation for different types of companies. As a consequence, purchasing managers need to use the features of their purchasing processes and manufacturing system in case to develop the system of KPIs that helps to monitor the efficiency and effectiveness of their company's purchasing function (Carter et al. 2005).

Van Weele (2014) indicates that purchasing performance consists of two elements: purchasing efficiency and effectiveness.

Purchasing efficiency reflects relationships between planned and actual resources used in order to achieve a previously set target. Generally speaking it reflects the relationship between planned and actual costs in terms of organization of the purchasing process (putting

various guidelines and procedure into place, the use of various systems, the stuff of the purchasing department etc.).

Purchasing effectiveness is the degree to which goals and objectives are met in accordance with the planned course of action. In other words it relates to goals and objectives of the purchasing function. More specifically effectiveness relates to the purchase of the right materials and of the right quality and quantity from the right supplier at the required time and place, and at a minimal price. As well it should contribute to both product and process innovation, and supply risk reduction.

In this case purchasing performance can be viewed as capability of purchasing function to achieve its set of goals while spending minimum of a company's resources.

Considering purchasing performance evaluation van Weele (2014) suggests four key areas for measuring purchasing effectiveness and purchasing efficiency. When measuring purchasing effectiveness the author focuses on three dimensions:

1. Price/cost control and reduction. This key area includes two tasks.
    - ✓ The first is mo*nitoring* of the change of prices for purchasing materials, products and services.
    - ✓ The second involves activities aimed to *cost reduction* of materials, products and services.
2. Product and quality.
    - ✓ The first relates to contribution of purchasing to *product innovation*. Performance indicators in this case might be: the number of man-hours spent by the stuff on innovation projects, time spent by suppliers on engineering, project lead time etc.
    - ✓ The second element relates to contribution of purchasing function to the total quality control. Purchasing department should ensure that delivered goods meet the quality indicated in specifications. Here, the performance indicators may be: the number of rejected products, the number of approved supplier and suppliers having ISO certificates etc.
3. Purchasing logistics performance area.
    - ✓ Control of ordering process. Possible measures: number of orders and backlogs, time spent on ordering, the use of special electronic ordering systems, EDI with internal customers and suppliers and so on.
    - ✓ Control of due delivery times. The measures may be: supplier reliability in terms of delivery time, delay time, number of due date deliveries etc.

- ✓ Control over delivered quantities. Used measures are: inventory turnover, orders size, number of under deliveries and under delivered quantity per order, etc.

4. Purchasing organization. This dimension relates to purchasing *efficiency* and involves the following objects:
    - Purchasing stuff. Characteristics are: skill level, training, background etc.
    - Purchasing management. Describes how the purchasing department is managed. Characterized by the quality of strategies, plans, goals etc.
    - Procedures and guidelines. Reflects the degree to which purchasing process is formalized: instructions, working procedures for employees and suppliers.
    - Information system. Relates to improvements of purchasing information systems needed to support the stuff in their daily routine and accumulate information on purchasing activities for top management.

To sum up the above described key performance areas of purchasing, we emphasise that well developed purchasing performance measurement system should provide constant monitoring of both effectiveness and efficiency indicators. All dimensions are interrelated and by focusing on only one key performance area, the other area may be negatively affected. Another important moment we need to mention is that the four areas can be measured and assessed on the different level of aggregation; at the level of individual, department or company level for example. Therefore there is a large degree of variation between purchasing performance measurement systems. So, when developing such a system, it should be adopted or aligned to the company's specific needs.

3.3 Theoretical basics of the balanced scorecard system

In this section we present the BSC system and the advantages of its implementation to purchasing performance evaluation.

Performance measurement is a foundation of successful management of any company. The famous theorist in management area, Peter F. Drucker said "*if you can't measure it, you can't manage it*" (Drucker institute 2015). We emphasize the significance of performance evaluation for the companies' management with the use of BSC.

3.3.1 Balanced scorecard concept

The *"balanced scorecard"* (BSC) concept was first introduced in Kaplan and Norton (1992) as a new method of performance evaluation. This method has been widely used by companies and has not lost its relevance even today.

According to Kaplan and Norton (1996) BSC is a comprehensive set of KPIs which linked to mission and strategy of a company, and provide the framework for a strategic evaluation and management system. The BSC evaluates company's performance through the prism of four perspectives: financial, customers, internal business processes, and learning and growth. These four perspectives provide the framework for the BSC (Figure 4).

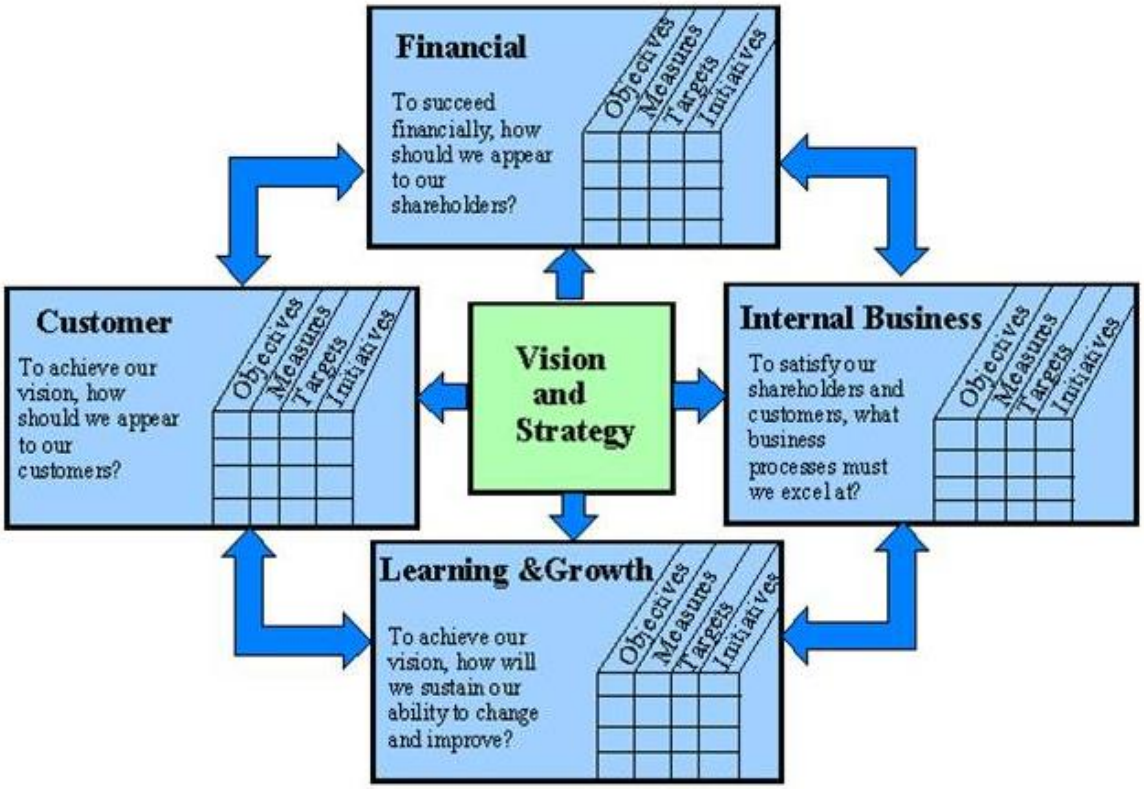

Figure 4: The balanced scorecard framework (Source: Kaplan and Norton 1996).

Wagner and Kaufmann (2004) claim that the main reason for development of BSC concept were shortcomings of traditional financial measures as a business performance evaluation. Ghadim and Nobarzad (2012) mention that financial measurements are good indicators of past performance and inefficient in indicating real value, including intangible assets such as: employee skills and capability, motivation and flexibility, customer relation, data bases and information networks. These factors are significant for companies' success

in competitive environment. In an attempt to overcome these barriers, some performance measurements frameworks were developed. The main idea in BSC is to define and balance different drivers of the company's long-term profitability Axelsson et al. (2002).

For better understanding of BSC concept we will examine briefly the methodology developed by Kaplan and Norton. The BSC encompasses the four perspectives:

Financial perspectives

The BSC includes the financial perspective since financial measures are very effective in aggregation of the measurable economic results of the performed activities.

Financial performance measures provide an insight into how a company's strategy implementation, and execution influence the financial outcome. Financial objectives are basically associated with profitability which may be measured by operating income or return-on-capital employed. As an alternative option, fast sales growth or cash may be set as financial targets (Kaplan and Norton 1996).

Customer perspectives

When evaluating the performance from the point of view of customer perspectives, managers define the target customer and market segments where the business unit is supposed to operate. Then, they define the measures of its performance in these segments. may be taken The level of customer satisfaction, customer loyalty, growth of customers' data base, profitability of customers, market share in the targeted segment may be taken as indicators which measure the performance from customers' perspectives. The *customer perspective* is supposed to involve certain measures which reflect value propositions that the company is ready to provide for a customer in the targeted market segments. The drivers related to the core customer outcomes and inherent for the targeted segment are defined by crucial for the customer factors which strongly influence the willingness to select a new supplier or to stay loyal to the current one. To sum up, the customer perspective grants the possibility for managers to connect the critical for a customer factors and business unit's market strategy in a way that leads to higher financial performance (Kaplan and Norton 1996).

Internal-business-processes perspective

From the point of view of *internal-business-process perspective*, business unit managers outline those internal processes in which the business unit must succeed. Concentration of organization's efforts on the performance of these processes leads to:

- Value propositions attracting and retaining new customers
- Stakeholders satisfaction in terms of excellent financial results.

Internal business process measures are concentrated on processes which have the influence on customer satisfaction and loyalty, and which help to achieve organization's financial goals.

There are two principal differences between BSC approach and traditional performance measurement. The first is that traditional approaches try to monitor and improve existing business processes, sometimes going beyond financial performance measures using quality and time-based metrics. While the BSC approach in addition aims to define new processes in which a business unit should succeed to achieve financial objectives and meet customer expectations. Furthermore, the internal-business-process objectives may reveal the processes which it would be advisable not to perform at all, that is important for the company's strategy to achieve the success.

The second difference is that the BSC aims to implement innovative processes into the *internal-business-process perspective*, when traditional performance measurement approach focuses on delivery of existing products and services. Compared to BSC, traditional approach tries to control and improve today's operations, representing the short chain of value creation. Such chain starts with an order receipt from the existing customer for the existing product and finishes at a point when the product is delivered to a customer. Analyzing financial performance in the long term perspective may lead to creation of new products which are able to meet existing and future customers' requirements. For many companies, innovative processes and long chain of value creation, involving product design and development, are viewed as more effective for financial performance compared to short chain of value creation. There is no need for executives to choose between these two internal processes, since the objectives and measures of the BSC concept suit for both long-chain innovation cycle and short-chain operations cycle (Kaplan and Norton 1996).

Learning and growth perspectives

The next perspective of the BSC concept, learning and growth, focuses on the infrastructure creation needed by the business unit for the long-term growth and improvement. *Internal business process perspectives* together with *the customer perspective* define the most important for a business unit factors for current and future activity. For companies it would be quite problematic to materialize their long-term objectives with the use of existing technologies and with current capabilities.

In the organizational learning and growth perspective three main sources are considered:

- ✓ People – (employee loyalty, satisfaction and skills depending on the market requirements and possible investment in training).
- ✓ Systems – excess to and suitability of IT systems corresponding to both customers and employee requirements.
- ✓ Organizational procedures – improvements in the core customer-based processes and company's internal processes.

The first three perspectives of the BSC highlight the gaps between the existing capabilities of people, systems, and organizational procedures and their required level to ensure excellent performance. And here, *learning and growth perspectives* enables to reduce this gaps by investing into employee training and IT, and the adjustment of organizational procedures and routines.

One frequently asked question has been widely discussed in BSC literature: Are the four perspectives sufficient? Answering this question, Kaplan and Norton (1996) claim that these four perspectives are the template for BSC development. The number of perspective depends on industry conditions and a business unit's strategy. The BSC might be suggested for departments and functional units. In this case, the company's BSC is cascaded down, the mission and strategy can be defined within framework established for company's business unit.

3.3.2 Advantages and applications in purchasing

In most cases, the literature dedicated to BSC concept focuses on its usage for "traditional" implementation of business unit strategies and describes BSC application in different industries. In spite of inherent flexibility of the BSC approach to strategic management and control, allowing for diversity in terms of its application in various industries and functional areas, the existing literature investigating the BSC application to some specific functional areas is quite scarce. Relatively small number of works, dedicated to the use of BSC concept by companies in purchasing, supply chain management and logistics have appeared for the last decade. The number of firms using BSC started to increase form the beginning of 2000s (Wagner and Kaufmann 2004). While there are some publications dedicated to BSC application in logistics (Liberatore and Miller 1998; Siepermann 2003) and supply chain management (Shafiee et al. 2014; Bhagwat and Sharma 2007; Weber et al. 2002; Zimmermann 2002; Brewer and Speh 2000; Stölzle et al. 2001). The literature dedicated to application of BSC in purchasing is basically represented by

managerial publications (Axelsson et al. 2002; Quervain and Wagner 2003; Aich and Fiedler 2004; Carter et al. 2005).

Since the BSC was developed, some debates has taken place on its modification and adaptation in order to adjust to different business areas and to purchasing as well. Wagner and Kaufmann (2004) presented a very valuable research dedicated to elimination of barriers in initiation and use of BSC in purchasing (P-BSC). Motivation of their research is based on the vision that application of BSC in purchasing can foster more efficient implementation of purchasing strategies and that firms may position themselves better to cope with barriers of BSC implementation. On the example of seven case studies the authors indicated 12 barriers inherent to BSC implementation: 7 barriers during initiation and setup phase and 5 barriers during roll-out and use. The authors emphasize that their work may be used as a framework for those developing the P-BSC.

As it was described above the traditional perspectives of the BSC concept involve: financial, customer, internal business processes, and learning and growth perspectives. Axelsson et al. (2002) argue that purchasing and suppliers are not clearly define this concept but influence the four perspectives. The authors emphasize that purchasing and supply might be inherent to internal business process perspective, but with some specifications relating to purchasing and supply chain management. The BSC could be helpful in the identification and development of processes for internal and external activities. If one aims to stress attention on purchasing performance then, within the perspective of the BSC should be incorporated a strong candidate to measure company's performance (Carter et al. 2005). This could be: the number of business transactions carried on with long-term agreements, the number of current product development projects, costs associated with supplier, the number of suppliers of a certain capability level, measurements of co-operative processes (for example the number of purchases items specified in the contract as obligatory) etc.

There are many authors who applied the BSC concept in its traditional way using the four perspectives (Brewer and Speh 2000; Axelsson et al. 2002; Zimmermann 2002; Shafiee et al. 2014; etc.). Also, there are those (Stölzle et al. 2001; Quervain and Wagner 2003; Aich and Fiedler 2004) who in the area of purchasing and supply chain management, in addition to the four traditional perspectives, incorporate into the BSC the fifth perspective – supplier perspective. Such extension of perspectives is caused by the high importance of supplier and the supplier perspective may then contain a wide set of performance measures such as supplier portfolio, supplier relationship management, innovation potential etc. (Wagner and Kaufmann 2004).

Smith (2006) defines the following factors needed to be checked and verified in each company for successful BSC implementation:

- Commitment. Should present at all levels of an organization and especially at the level of top management.
- Transparency and clarity. All the stuff must understand the goals and procedures set for the change.
- Communication. Communication process is essential across the entire organization.
- Accountability. Responsibilities, between individuals and internal business units, for the results of the BSC program must be clearly assigned and distinguished.
- Performance measures. The system of performance measures should be incorporated to provide the management with complete information. Also the system of rewards is required to provide recognition of employees.
- Link to strategy. BSC at the department level should be strongly aligned to overall corporate strategy. All procedures, goals and tacks should contribute to the improvement of the company's progress.
- Reports. This factor is often overlooked. Reports that document the success of program serve as instruments for taking decisions on approving and further development of the BSC program.

4. APPLICATION OF BALANCED SCORECARD TO PURCHASING PERFORMANCE EVALUATION

The process of BSC development and the process of setting KPIs as a performance measurement of purchasing and supply management are described in the current chapter.

4.1 Methodology of balanced scorecard development

When companies decide to implement the BSC, they have to go through several steps. They are suggested by Balanced Scorecard Institute.

Figure 5 illustrates nine steps for development BSC.

Figure 5: Building &Implementing a balanced scorecard: nine steps to success (Source: Balanced scorecard institute 2015a).

The first step for developing BSC is the *assessment* of a company and its environment (stakeholders, market, customers, competition, etc.). The second step is to define a company's *strategy*, mission and vision that we have to focus on. On the third step we need to determine the company's *objectives* as a perspectives for the improvement of decision making. Then, we have to create *strategy map* and identify the *performance measures* related to strategic objectives. These performance measures should be defined as outcome and output measures and as well as leading and lagging measures. The next step

refers to the development of *strategic initiatives* (projects) according to the strategic objectives. The *performance analysis* step involves the calculations of all KPIs in a set of BSC performance measures. The results of calculations should be *analyzed and aligned*. The last one means that scorecard should be aligned according to the company's objectives on the different levels (operational, tactical, and strategic). On the *evaluation* step we can find out whether our expected results have been achieved or not (Balanced scorecard institute 2015a).

Bhagwat and Sharma (2007), in addition to the above mentioned, suggest two more steps:

- Develop a preliminary BSC based on strategic goals and targets.
- Revise it in accordance with comments and feedback received from management.

Wagner and Kaufmann (2004) claim that the process of BSC development requires appropriate theoretical knowledges, skills and experience in scorecarding process.

4.2 Putting strategy into the balanced scorecard

In this section we discuss the importance of aligning purchasing goals and activities to overall strategy and linking performance measures to purchasing strategy.

4.2.1 Aligning purchasing activity and overall strategy

The purchasing activities should be systematically measured and evaluated since they contribute and seriously impact the financial performance of companies (Chen et al. 2004; Hendricks and Singhal 2003). As mentioned by Baier et al. (2008) and González-Benito (2007), the degree to which purchasing function can be strategically integrated and aligned with a company's overall objectives is referred to as an internal "fit" or company's purchasing competence, is the most critical aspect in strategic purchasing activities. Purchasing aims to contribute to a company's strategic objectives through execution of special purchasing practices and activities. Hence, strategic purchasing is embodied via strategic integration of purchasing function (Pohl and Förstl 2011; Lintukangas et al. 2009).

It was widely discussed in existing literature, that in order to achieve an excellent level of functional strategic integration of purchasing function, development and incorporation of purchasing performance measurement system is required (van Weele 2014,

2010; Ellram et al. 2002; Kaplan and Norton 1992). Purchasing performance measurement system uses special measures for setting performance targets aligned with strategic goals, and such performance measures are the key elements of any performance measurement system (van Weele 2014, 2010; Carter et al. 2005). Then, the central question of measurement design is how performance measurements should be selected and planned in order to align purchasing practices and purchasing strategy (Neely 2005). As Wouters and Sportel (2005) emphasize, performance measures should strongly support a company's strategic goals.

As it was mentioned above, purchasing decisions cannot be taken irrespective of the other departments and corporate business units. Purchasing decisions should take into consideration their impact on other departments such as sales, marketing, logistics etc. Thus purchasing decisions should not just focus on minimizing purchasing spends and prices but also on optimizing the total cost of a company within the boundaries of the corporate strategy and interests of the other business units. Therefore purchasing and supply strategies should be designed and implemented in close cooperation with other internal business units of an organization for achieving maximum effectiveness and efficiency on a strategic level. Such approach to purchasing and supply management is referred to as *cross-functional integration* (van Weele, 2014). Purchasing function should be recognized as performance driven but not just as a service function which just have to satisfy internal customer's requirements. It should communicate with internal customers and then product and supplier decisions will be of higher quality and even at a lower cost. Accumulated experience from many companies shows that organizations where purchasing function is perceived not just as a service but performance driven, this function significantly contributes to healthy cooperation and innovation from the suppliers' side while providing lowers material and supply chain costs (Hoque 2014).

4.2.2 Linking balanced scorecard measures to strategy

The BSC represents not only a set of critical to the company's strategy indicators. The properly developed BSC should incorporate a linked set of strategic objectives and measures which are consistent and reinforce each other. A strategy itself can be viewed as a set of hypotheses describing the *cause-and-effect relationships*. Therefore, performance measurement system should provide a clear representation of relationships (or hypotheses) between company's objectives and outcome measures, within each perspective (financial,

customer, internal business process and learning and growth), so that they could be easily managed and validated (Kaplan and Norton, 1996). Furthermore, it should be emphasized that only strong relationships should be considered when developing a BSC. As Wagner and Kaufman (2004) note, one of the main problems when constructing the BSC is the difficulty of identification of strategic objectives and cause-and-effect relationships. The cause-and-effect relationships as mentioned by (Kaplan and Norton, 1996) may be described by a sequence of if-then statements through which a "story" of a company's strategy is explained. All the chosen measures for the Balance scorecard should be incorporated into this sequence of cause-and-effect relationships explaining the meaning of a business unit's strategy to the company.

As it was mentioned above, the generic outcome measures of a company or a business unit reflect its common goals and strategies. These output measures are supposed to be lag indicators, for example: employee skills, customer loyalty. In contrast to lag indicators, representing generic output measures, the lead indicators or *performance drivers* reflect the specificity of a business unit's strategy. As indicated by Kaplan and Norton (1996), a sound BSC should incorporate a mix of outcome measures and performance indicators. The use of outcome measures and ignoring performance drivers will inevitably lead to the lack of understanding of how the outcomes are achieved. Contrary, the use of solely performance drivers will lead to a short-term operational success and inability to explain weather such operational success influences the whole business and finally results in higher financial performance.

The business unit's strategic goals i.e. performance drivers (customer satisfaction, quality or quality for example), which are supposed to improve its performance may not do that in reality if they are considered themselves as the ends. The level of customer satisfaction, quality or innovation should lead to certain financial results. Therefore a BSC should have a very strong focus on business unit's outcomes and especially on *financial outcomes* (Kaplan and Norton 1996). It would be a mistake to focus only on strategic goals without linking them to outcomes that leads to the lack of understanding about the impact of performing of some strategic programs on financial payoffs.

Diverse and interrelated nature of purchasing and supply management activities along with their cross-functionality character makes it rather difficult tack to assess the purchasing and supply management contribution to the *financial outcome*. As Saranga and Moser (2010) indicate, performance measures can be subdivided into input level performance drivers and output level drivers. Hartmann et al. (2012) developed a model of

purchasing and supply management drivers. The model enables a researcher to assess how performance drivers impact the financial outcome. The performance drivers on the input level define the purchasing competence or maturity and involve supplier management, cross-functional integration, strategy, development, human resource management and purchasing and supply controlling (see Figure 4). Purchasing and supply management input drivers enable to measure purchasing competence that reflects the level of competency of the purchasing function. Das and Narasimhan (2000) indicate that purchasing competence represents itself a latent capability and therefore can be and is required to be operationalized and measured. The five above mentioned drivers enable to achieve operationalization. The input level drivers affect the output level drivers. The performance outcomes measurements or output level drivers are represented by two perspectives. The first reflects measurement of operational results, which are directly facilitated by purchasing competence, and represented by three mediate drivers: cost performance, quality performance and innovation performance. And the second perspective represents financial performance outcomes. As we see from the model, financial performance depends on three mediating outcomes and also related with purchasing competence.

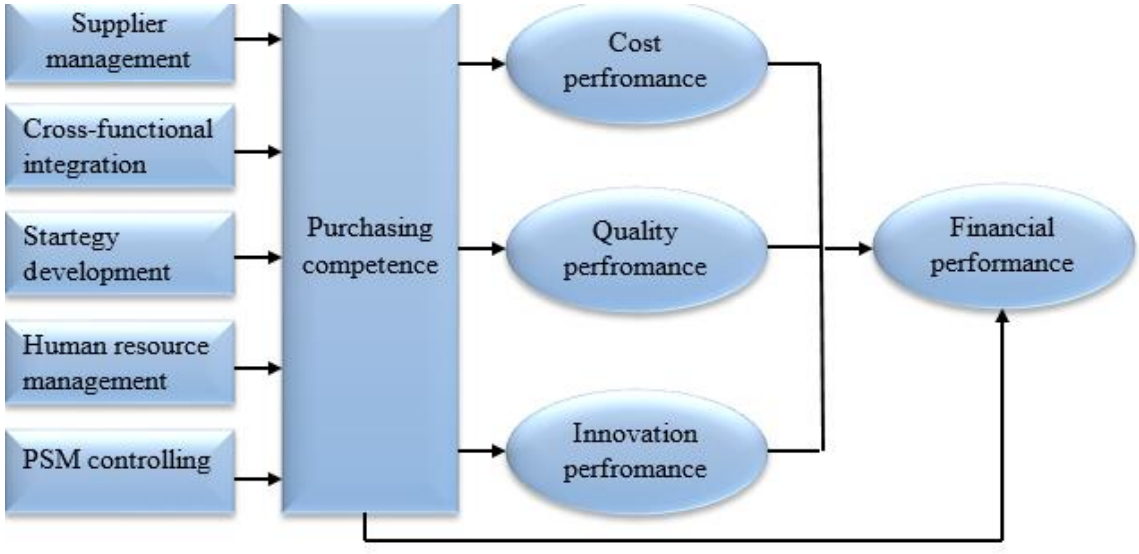

Figure 6: Purchasing and supply management performance drivers (Source: Hartmann, Kerkfeld and Henke 2012)

Hartmann et al. (2012) in their research used this model to show how purchasing competence and mediate drivers contribute to financial performance. The approach developed by the authors could be a useful framework for linking purchasing and supply management performance to financial performance.

4.3 Key performance indicators

Bhagwat and Sharma (2007) represent three main criteria for the KPIs: measures should be (1) quantifiable, (2) easy to understand, and (3) be collected and analyzed in cost-effective manner.

Balanced scorecard institute (2015b) offers detailed requirements for KPIs that are used in a BSC system as a measurement of a company's performance. KPIs are performance measures that register and direct organization's progress to meet the required outcome. Strategic KPIs reflect the operational efficiency and effectiveness of implementation of an organization's strategies and define the deviation between the real and targeted performance.

The good KPIs should:

- ✓ Show a clear and objective picture of strategy implementation results
- ✓ Provide a comparative look at the degree of performance change over the time
- ✓ Enable employees to concentrate their attention on primary tasks and problems
- ✓ Allow for measurement of a final result but not just performed task or work
- ✓ Represent by themselves a universal language for communication within and outside the company
- ✓ Foster intangible uncertainty reduction
- ✓ Be capable to guarantee the measurement of the right things
- ✓ Be capable to ensure the accuracy of the data collection

(Balanced scorecard institute, 2015b)

Brewer (2002) states that on average a BSC should have around 20-25 measures which are supposed to support the corporate strategy and interlinked together in a chain of hypothesis statements by the cause-and-effect relationships. Creation of such linkages enables a company to define how investments into learning and growth will contribute to continuous improvement, increased customer satisfaction and finally to financial success. Based on these criteria and requirements, the set of KPIs will be created as performance measures of purchasing and supply management according to the company's strategy, vision and objectives. The BSC measures should cascade through organization's business units and down across its levels so that all the stuff is assessed and rewarded with use of measures incorporated in the BSC (Brewer 2002).

Purchasing strategic ratios and measures are difficult to obtain and a lot of work is required in this area. Nevertheless, Center for Advanced Purchasing Studies (CAPS) introduces on regular basis the last achievement on purchasing performance for different

types of industries. CAPS's reports may be used as benchmarks by purchasing managers to compare their performance relative the colleagues in the same industry. This information enables a purchasing manager to assess whether purchasing department is going in the right direction, implements the right strategies and peruses the right goals. Comparison of performance within a company does not provide a clear picture. Analysing business unit`s performance both internally and externally seems much more useful (CAPS 2015).

5. RESEARCH METHODOLOGY

This part of the paper focuses on the methodological basics of the research including description of step by step process of writing a research paper, explanation of the research method based on the case study, data collection process clarification and determination of validity and reliability of the current research.

5.1 Research process

Research process is triggered by identification of the research area and research problem. After the research problem is defined together with research methodology, research questions and unit of analysis i.e. case study is designed – a step-by-step plan of the research should be set. Such plan represents the structure of step-by-step analysis starting from the research problem and ending with findings and recommendations.

Research process structure (scheme) is presented on the figure below:

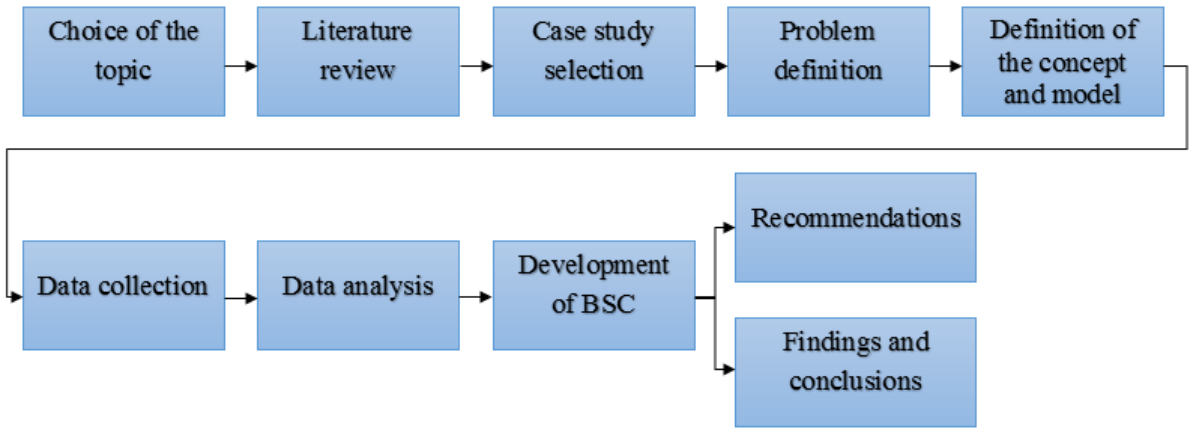

Figure 7: Structure of research process (Source: own display).

According to Eisenhardt and Graebner (2007), a good research should be started with a good survey of related literature. Yin (2014) claims that complete research design should involve a theory of what is being studied. Based on the theory and the defined problem the necessary qualitative and quantitative data is then collected and analyzed. On the next step, BSC is developed for the purchasing and supply management performance evaluation of a case study company. Finally, there are two outcomes of the research which may be considered in parallel: (1) recommendations to the case company for improvements of their purchasing operations and supply management, and (2) interpretations of the results and

suggestions for the performance evaluation of purchasing activities for the companies, which operate in ETO logistic environment.

5.2 Case study method

Research questions of the defined research problem naturally lead to the research methodology to be applied by the researcher: case study, experiments, survey or archival analysis. According to Yin (1994) there are three conditions to be analyzed for the research strategy selection: (1) type of research questions, (2) control of researcher over behavioral events, (3) prevailing contemporary or historical events. Regarding the first condition, the main research questions of the current study are "why" and "how". The second condition to be examined is whether we can control behavioral events and have an access to them (Yin 1994). In our study we are unable to manipulate behavior directly and precisely as it can be done in experiments. Finally, we have to determine which types of events we are examining. We cannot say that we deal with historical events. On the contrary, we are trying to examine contemporary occurrences with the ability of interviewing and direct observation. We have access to documents, interviews and observations. According to Yin (2014) the case study is to be preferably selected as a research method when a researcher has almost no control over events, when some contemporary phenomenon is studied and when the main research questions are "why" and "how". Case study as a research method is beneficial since it provides broad and deep insight into studying a phenomenon (Ellram 1996). The performance evaluation of purchasing and supply management using BSC in companies which operate in ETO logistic environment is relatively new idea. A single case study method is chosen in order to assess the benefits of P-BSC implementation and to provide some recommendations to the case study company. There are several reasons in favor of a single case (but not multiple). The first reason, is that dealing with only one company will allow for exploration of its purchasing operations and supply management more properly. Secondly, we assume that the chosen company is a typical representative among the same industry companies which operate in ETO production environment. The case study company is a leading supplier of a customized product to it’s market with more than 40 years of experience in design, engineering and manufacturing. Moreover, the company has an international reputation for know-how in design, on time delivery of high quality products to oil and gas industry.

Now we have to specify the unit of analysis of this study. According to Yin (1994) "As a general guide, the definition of the unit of analysis is related to the way the initial research questions have been defined." Therefore, the unit of analysis is the company's purchasing activity. According to Yin (1994) classification of types of research design, our case study strategy implies single-case holistic (single unit of analysis) design.

There are two things related to theory that need to be clarified before examining data collection aspects. First, the existing theory related to the research problem is supposed to be used to support the research at its every step (data collection, data analysis, etc.). Second, the theory on application of BSC to purchasing performance evaluation may be supplemented by the analytical generalization of the research findings. Although, the conduction of single case study is not quite appropriate for generalization (Yin 2014), we assume that the results may be used by other companies in this industry for the reason of their similarity (as it was mentioned above).

Now we have to specify what kind of data has to be collected, depending on the research aim and research questions. Talking about the type of data, we distinguish quantitative and qualitative. As Cooper and Schindler (2008) mention, quantitative analysis is applied for testing theories and checking hypothesizes, with the aim of validating something or finding out how frequent this or that event is occurring. In this type of analysis statistical data is basically used. Qualitative research, contrary to quantitative, uses qualitative data and information: surveys, direct observation, expert opinion, questionnaires, etc. In this type of analysis research aims to understand the essence of some phenomenon or situation, deduce the cause and effect relationships between the elements or components of the analyzed object and with other objects. According to Ellram (1996), qualitative research enables researcher to dive deeper into the problem and based on the discovered findings give the appropriate recommendations. According to the nature of the studied problem and questions, our research is more qualitative rather than quantitative, since it explores not only the context and benefits of purchasing performance evaluation using BSC but also provides some recommendations for the company regarding the improvements in their purchasing operations and supply management. Nevertheless, quantitative data will be used for better understanding of the company's purchasing operations and supply management. Such approach of complementing the qualitative research by quantitative data allows to enhance the quality of recommendations.

5.3 Data collection

Data collection is one of the most important step in research. For this reason, we should clarify what data sources and data collection methods will be applied to answer the research question and evaluate outcomes.

Since the unit of analysis in our research is the company's purchasing activity, we are interested in the informants who possess specific knowledge and trustworthy information about the case, and are ready (or have the right) to provide this information. For this purpose key informant approach is often used for the investigation of intra and inter firm phenomena. This approach is beneficial when in-depth information cannot be received from survey respondents (Kumar, Stern and Anderson 1993). Another advantage of this approach is that it provides holistic and qualitative overview in a relatively short period of time. Contrary to respondents who may provide information based on their personal attitudes and feelings relating to the phenomenon, key informants are demanded to provide answers pertaining explicitly to research problem and independently of they own attitude (Phillips 1981). Key informants are supposed to be employers of Midsund Bruk AS and occupy positions in purchasing department to be able to provide information related to the main research questions. In our research, semi-structured interview has been developed to collect qualitative information form key informants. For that purpose "interview guide" has been developed and represents an ordered list of questions and topics for discussion. The list of questions for an interview is represented in Appendix 1.

In order to conduct this study the primary data and the secondary data were collected and comprehensively analyzed.

Secondary data sources are basically applied with the aim of construction of the theoretical framework (BSC, purchasing, ETO production approach) for the research. These sources are:

- ✓ Scientific literature (scientific papers, specialized data bases, dissertations, conference papers).
- ✓ Journals (Journal of Purchasing and Supply Management; Journal of Supply Chain Management System; International Journal of Information, Business and Management; etc.).
- ✓ Internet (web-pages).
- ✓ Special reports issued by public and private organizations.

With respect to the qualitative data, primary data sources are used to explore the company's purchasing operations and supply management. Quantitative primary data is used for the results assessment and for better quality of recommendations. Planned indicators, financial data and required accounting figures were kindly provided during the meeting with company's purchasing manager.

5.4 Validity and reliability

Evaluation of the quality of the chosen research design is essential if the obtained findings are supposed to be used in practice or implemented. Researchers are required to make some judgements about the "soundness" of their work with respect to the methods applied, trustworthiness of data collected and integration of findings (Brymman and Bell, 2003).

It is obvious that some criteria are needed to evaluate the quality of the chosen research design. As Yin (1994) emphasises, research design is supposed to represent a logical test set of statements, the researcher can comment.

Yin (1994, 2014) proposes to use four tests to define the quality of any empirical research. The tests include: construct validity (the right measures for used concepts), internal validity (test on establishing of casual relationship), external validity (generalization of study`s findings) and reliability (errors and bias minimization in a case study).

- ✓ Construct validity test. In our case, the best tactics is to have a draft case study report submitted to key informants for reviewing (Yin 1994).
- ✓ Internal validity. This tactics is only applied for explanatory and descriptive cases studies.
- ✓ External validity. This test relates to findings generalization, that we have already discussed above in this chapter. According to Yin (2014), some researchers claim that a single case study offers poor base for generalization. The author then argues that such researchers put analogy to survey research where a "sample" is easily generalizes and generalization does not to work with case studies. Nevertheless we have to distinguish between statistical generalization on which surveys relay and analytical generalization applied for case studies. In our case we strive to generalize findings to some broader theory. The company selected as a case is considered to be a typical representative of companies within this industry. It has similar strategic goals, structure, processes etc. to other companies in the industry.

Reliability is achieved by proper documenting of the case study's steps. According to Yin (1994) such tactic is referred to as case study protocol. During the process of data collection for current research the data from interviews were recorded and approved by respondent. The rest part of the data was collected from the company's official website. Furthermore, every step of P-BSC development, based on the analysis of respective literature, is described in detail and presented in chapter 7 of this paper.

In addition, Yin (1994) claims that the use of this tactics reduces errors and enables a researcher to receive the same findings when conduction/repeating this case study over again.

6. CASE STUDY AND DATA ANALYSIS

This chapter presents the case study description and analysis of collected data about company's purchasing operations and supply management.

6.1 Case study description

In the current section of the paper the case study description is based on the information that was provided during the interview with company's purchasing manager.

The purchasing activities play central role in the business processes of Midsund Bruk. According to the company's organizational structure (Appendix 2), the purchasing operations take a position at the same level as a project's design and engineering. During the interview with purchasing manager of the company it was clarified that the company does not have purchasing department as a separate structural unit of their organizational structure. The duties and responsibilities for the purchasing operations are delegated to specialists from different departments of Midsund Bruk. At the present time, five specialists are responsible for company's purchasing and supply activities: purchasing manager, transport manager, specialist in logistics, and two warehouse's workers. The main responsibility for the results of purchasing operations rests with the purchasing manager of Midsund Bruk.

As it was mentioned in chapter 2, the company operates in ETO logistic environment. It means that all activities of Midsund Bruk, including design, engineering, manufacturing, and purchasing operations as well, are related to specific customer requirements. The entire project of Midsund Bruk is carried out just for one customer. Every project of the company is discussed in detail between the customer and specialists in design and engineering. The lead-time for design, engineering, production and delivery of the end product (pressure vessels or LNG storage tanks) takes approximately six months. The delivery lead-time of some purchased materials in accordance with the customer specific requirements might be up to five months. This explains the need of close collaboration between specialists in design and engineering and purchasing manager of the company. If some changes in the project are taking place the purchasing must be adopted to these changes very quickly.

Quite often for the customers of Midsund Bruk the quality of the end product and the time of delivery are more significant than price. In this case, with respect to purchasing

operations, the company's purchasing manager focuses on the quality and on-time delivery of purchased materials. The required for production materials, parts, items are purchased in accordance with specific customer requirements, design and engineering specifications.

To conduct some of project design operations Midsund Bruk is using ANSYS software. It is an engineering product simulation software that helps company to solve the most complex design and engineering challenges. With the use of this software the list of all materials and parts that needed for the project is created. The process of purchasing starts in parallel with project design process. A special software, adopted to Midsund Bruk requirements, is utilized for purchasing and accounting operations. Company's information system includes the database about their suppliers and all real time information about the availability of raw materials in stock, purchased materials, and items in transit.

Midsund Bruk has all facilities for storage, loading and unloading of the purchased materials. The company's storage area exceeds 25000 m^2 (Midsund Bruk 2015b). The raw materials might be delivered to the company by inland transport as well as by cargo ships. The company has all possibilities for delivery by sea, such as: deep water quay, barge pier and portal crane.

The number of company's suppliers is approximately 150. The key suppliers are from Germany, Belgium, Sweden, and Italy. Midsund Bruk has a deal with third-party logistics operators which perform transportation service for delivery of purchased materials. The agreements are signed with logistic companies such as: Kuehne + Nagel AS (Norway) and Bring Logistics Solutions AS (Norway).

The decision making about the choice of particular supplier of required materials and parts for company's project is based on the company's experience and earlier established relationships with suppliers. Three main criteria are taken into consideration for choosing supplier: (1) lead-time of delivery, (2) quality of purchased materials, and (3) cost.

Midsund Bruk has the system of supplier performance evaluation suggested by the company-owner. Purchasing manager of Midsund Bruk evaluates company's supplier performance based on the six following criteria:

- On-time delivery of material.
- On-time delivery of documentation.
- Quality of received materials.
- Quality of received documentation.
- Collaboration and responsiveness.

- Health, safety and the environment (HSE)-evaluation.

HSE indicator for evaluation of suppliers' performance was developed in accordance with NORSOK (Norsk Sokkels Konkuranseposisjon) standards. Norwegian petroleum industry developed NORSOK standards with the purpose to ensure safety, cost effectiveness and value adding for operations and developments in petroleum industry. HSE management system includes seven elements for evaluating of supplier performance: (1) leadership and commitment, (2) policy and strategic objectives, (3) organization, resources and documentation, (4) evaluation and risk management, (5) planning and procedures, (6) implementation and monitoring and (7) auditing and reviewing (NORSOK STANDARD S-006 2000). Calculated overall score for each supplier provides the basis for supplier selection.

Taking into consideration that Midsund Bruk produces customer oriented product, the frequency and the amount of orders depend on the project. Since the company operates in ETO logistic environment, there is no need to keep materials in stock. It should be noted that Midsund Bruk has optimal safety stock of regularly required materials.

With respect to the case study company, which operates in ETO logistic environment, all above mentioned characteristics and features reveal detailed picture of company's purchasing activities.

Recognizing the importance of measurement and evaluation of effectiveness and efficiency of purchasing operations, company's managers use the KPIs which are primarily of a financial nature. The set of KPIs includes such measures as: planned purchasing cost, actual purchasing cost, difference between target and actual prices by purchased item, percent of purchasing cost in total project cost, cash-to-cash cycle time, the number of on-time deliveries, the number of late deliveries and the number of incomplete deliveries, etc. It should be noted that company's managers focuses on some KPIs and does not have the performance measurement system. This is a bottleneck in the company's assessment of purchasing activities.

Wide range of benefits were provided in the chapter 3 of this paper that favors the choice of BSC approach for performance evaluation. The developed P-BSC will represent the performance measurement system for evaluation of purchasing activities of the company that operates in ETO production environment.

6.2 Data analysis

In this section of the paper we present data analysis of purchasing operations of a case study company which includes the strengths, weaknesses, opportunities, and threats (SWOT) analysis of company's purchasing activities and ABC analysis of company's suppliers and purchased items.

According to the opinion of experienced specialist in procurement, Jean M. Smith (2006), an analysis of company's internal environment can be proposed as an initial step for BSC development. The results of SWOT analysis will help to identify specific strategic objectives that will maximize and increase its strengths and opportunities and minimize or eliminate its weaknesses and threats. In order to identify strengths and weaknesses of a company's purchasing activities the SWOT analysis was conducted and the results are presented in the following matrix (Table 1).

Table 1: SWOT matrix of company's purchasing activities

Strengths	**Weaknesses**
Close cooperation with specialists in design and engineering Well-established long term relationships with the main suppliers Company's location is close to the most of suppliers High level of professionalism of the personal that are responsible for purchasing Technology: company's purchasing system contributes to better order handling Reporting of actual results versus planned Communication with financial department (regulation of payment operations) Evaluation report to supplier	The complexity of projects → detailed materials specifications High level of dependency on suppliers conditions (time of delivery, price, minimum order quantity, etc.) Project agreed budget → limited purchasing costs Traditional financial indicators are utilized as a performance measures Design and engineering information system are not integrated with purchasing information system The absence of suppliers involvement in project development
Opportunities	**Threats**
New project → establishing a new connections with suppliers on better contractual terms and conditions Establishing performance measures and initiatives	Unpredictable customer demand Technical changes in the project → purchasing must be quickly adopted to these changes High level of specificity of customer's requirements Regulations in production scheduling Long delivery lead-times with high uncertainty Limited choice of suppliers

Source: own display

Considering the factors that influence on the effectiveness of company's purchasing activities we can clarify the weaknesses and threats to purchasing operations of Midsund Bruk.

The purchasing of the company that operates in ETO environment depends on the customer requirements and technical specifications. Company's specialists in design and engineering create the detailed specifications based on customer requirements. One of the features of purchasing in ETO companies is a long delivery lead-time of needed project parts due to its long production lead-time at suppliers' side. Purchasing operations are conducted both at the phases of product design and production. The complexity of the project design leads to the uncertainty for the buying company and its suppliers.

The challenge for the specialists in design and engineering is to specify some important customer requirements for the needed materials or parts on the project. This inevitably leads to challenges for purchasing manager: to find the supplier of materials or parts that will meet technical specifications and requirements. Furthermore, one of the threats for company's purchasing is that customer may choose the supplier of needed materials or limit the number of suppliers.

Technical changes in the project are normally create the most sophisticated problems for the company's purchasing manager. These changes may appear at the phase when the item is already ordered or has already been delivered to the company. Sometimes designer may choose the appropriate material or the part for the project without taken into consideration such important factors as delivery lead-time and price. Customer's requirements have a serious impact on the project's lead-time.

The purchasing activities of Midsund Bruk put pressure on the required skills and experience of a purchaser. The purchasing activities should be quickly adopted to the changes in internal and external environment. One of the challenge of the company's purchasing activities is that design and engineering information system are not integrated into the purchasing information system that has a negative impact on the cross-functional integration.

All the above mentioned factors create threats for purchasing activities of a case study company and explain their weak sides.

Monitoring and evaluation of key suppliers is essential to the company which operates in ETO logistic environment. Also, there are materials and components which are crucial to company's business process and purchased from unique suppliers. For this reason the company should distinguish between the suppliers and items on which it should

concentrate its efforts. The results of ABC analysis help to find out which suppliers and purchased items are crucial to the case study company in terms of their contribution to the total purchasing cost. It means that KPIs in the suggested P-BSC should be in the first place calculated based on performance indicators with key suppliers.

The data for ABC analysis relates to one of the company's project named "ER245 Ivar Aasen". According to this project, Midsund Bruk design, engineer and manufacture separators for offshore industry. The contract was signed with Norwegian Oil Company in 07.05.2013. The duration of the project is one year. The project was started in 05.07.13. The day for delivery of produced vessels was settled to 17.07.14. The data that relates to purchasing activities on this project were provided by the company's purchasing manager.

The results of the conducted ABC analysis are presented in Appendixes 3 and 4, and summarized in the figures and tables below.

Figure 8 shows the results of ABC analysis of company's suppliers in terms of their contribution to total cost of purchased items. In addition, Table 2 shows absolute and relative contribution of each supplier group to the total purchasing cost and the number of items per each group of suppliers. The results of analysis shows that suppliers of the group "A" (providing 80% of the company's purchases in monetary terms) make up only 3,7% of the total number of suppliers and deliver 7% of total purchased items. In absolute terms the number of suppliers of the group "A" is only 2 and the number of supplied items is 27.

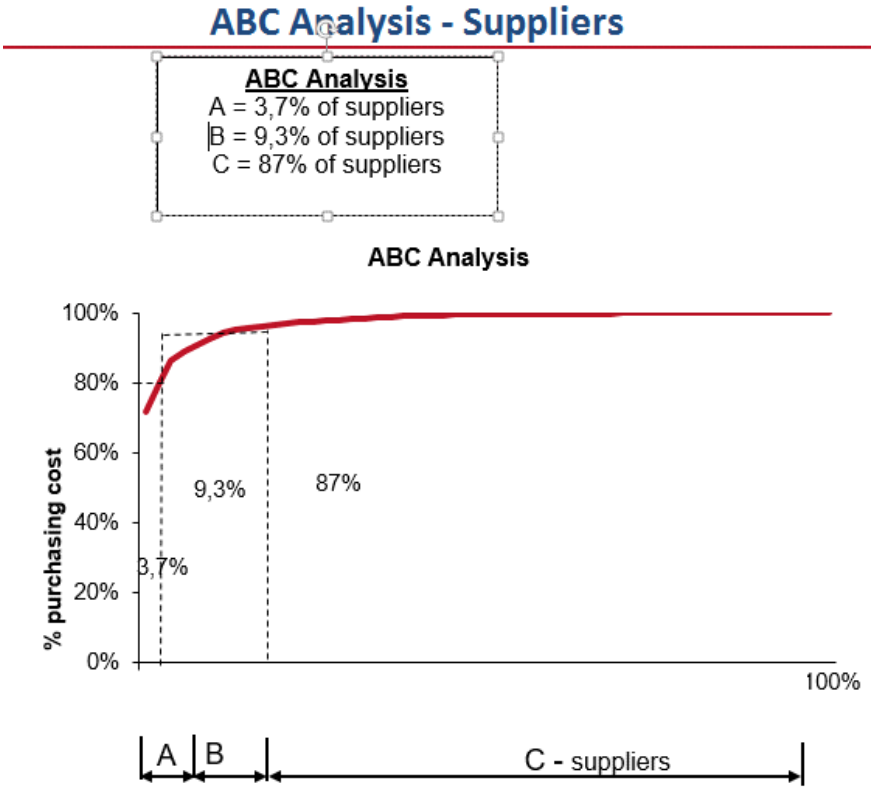

Figure 8: ABS analysis of suppliers (Source: own display)

The number of the suppliers of the group "B" (providing 15 % of the company's project purchases) is 5 or 9,3% of the total number of suppliers that delivery of 31,3% of purchased items. Finally, group "C" (5% of the company's project purchases) accounts 47 suppliers or 87% of the total number of suppliers and provides 61,6% of purchased materials and components.

Table 2: ABC analysis of suppliers

Supplier group	Number of suppliers	% of suppliers	Cost (NOK)	% of Cost	Number of items	% of the total number of items
A	2	3,7	27 533 829	79,3	27	7,1
B	5	9,3	5 247 202	15,1	120	31,3
C	47	87,0	1 945 581	5,6	236	61,6

Source: own display

The results of ABS analysis of purchased items are provided in the Table 3 and Figure 9.

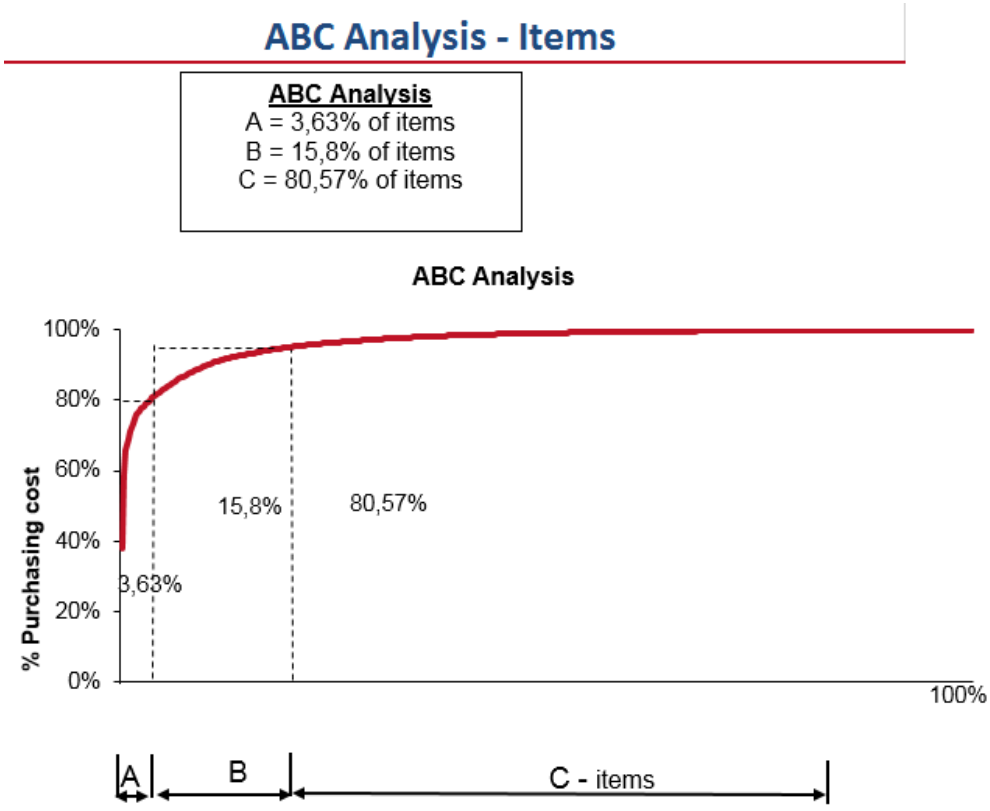

Figure 9: ABS analysis of purchased items (Source: own display)

The results of ABC analysis of purchased materials and components shows that the number of items of the group "A" is 13 or 3,63% of the total number. Group "B" (15 % of

purchasing cost) accounts for 15,8% of total number of purchased items and group "C" – 80,57 % respectively.

Table 3: ABC analysis of purchased items

Item group	Number of items	% of items	Cost (NOK)	% of Cost
A	13	3,63	27 630360	80,1
B	62	15,8	5164464	14,9
C	322	80,57	1736685	5,0

Source: own display

Based on the results of ABC analysis of the company's suppliers and purchased items we may combine ABC ranks in terms of suppliers and purchased items (Table 4).

Table 4: ABC analysis of suppliers and purchased items

Supplier group	Item group			Total
	A	B	C	
A	57,1	42,9	0	100
B	26,2	45,9	27,9	100
C	1,0	28,6	70,4	100

Source: own display

The results of analysis provided in the Table 3 show that 57,1% of items that belong to the group "A" and 42,9% of items that belong to the group "B" are delivered by the suppliers of the group "A". The suppliers of the group "B" deliver 26,2% of items of the group "A", 45,9% of items of the group "B" and 27,9% of items of the group "C". Finally, suppliers of the group "C", 1% of items belong to the group "A", 28,6 – to the group "B" and 70,4% - to the group "C".

To sum up the results of ABC analysis, we emphasize that suppliers of the group "A" are the company's strategic suppliers. The long-term and reliable relationships should be preferably established between the suppliers of the group "A" and Midsund Bruk. The purchased items that belong to group "A" are also strategic for the company. The orders of materials and components of the group "A" should be preferably placed on the early phase of the project design and special control of quality should be provided. Strategic suppliers that deliver strategic items should be taken under special control.

Therefore, presented above results of SWOT analysis and ABC analysis contribute to better understanding of company's purchasing activities and create the information base for the development of P-BSC as a performance measurement system of purchasing and supply management of Midsund Bruk.

7. DEVELOPMENT OF PURCHASING BALANCED SCORECARD

This chapter of the paper is devoted directly to the development of P-BSC with the purpose of the performance evaluation of purchasing and supply management of a case study company. The preliminary P-BSC with defined objectives and KPIs of the purchasing and supply management activities of the case study company was presented to purchasing manager of Midsund Bruk AS. Based on comments and feedback that we received from company's purchasing manager, P-BSC was revised and the appropriate amendments have been made.

7.1 Vision and strategy of the company

As it was mentioned in section 2.3 of this paper, the strategy goal of Midsund Bruk AS is to be the best pressure vessel supplier in the Eastern Europe. During the interview with company's purchasing manager it was clarified that in order to be the best supplier, the company needs to focus on: (1) the quality of the end product, which meets all customer's specific requirements, (2) project time in accordance with agreed schedule, and (3) the competitive price of the end product. The company's strategy determines the vision, mission and strategic goals in purchasing activities and supply management area.

Purchasing vision statement we can formulate as following: the flow of purchased materials and components is organized in that way that guarantees smooth and seamless production process and provides the value for the stakeholders.

The mission of purchasing activities is: to provide the most effective and efficient purchasing process and operations for the acquisition of quality materials and components.

During the interview with purchasing manager of Midsund Bruk we clarify the priority of four generic objectives in purchasing and supply management:

Quality (1).

Delivery (2).

Cost (3).

Flexibility (4).

Now we can specify the main objectives in purchasing as following:

- ✓ Increase the quality of purchased materials and components in order to meet customer requirements and engineering specifications.

- ✓ Reduce the lead time for delivery of purchased materials and components.
- ✓ Minimize purchasing cost of purchased items and provide savings generation.
- ✓ Maximize flexibility of purchasing operations in accordance with changes in internal and external environment.

Taking into account all the above mentioned generic objectives and the statements of vision and mission of the purchasing activities, we define the purchasing strategy as the following: the application of innovations in purchasing activities and key suppliers involvement in design and engineering process.

One of the step in the process of P-BSC development is to specify the critical success factors for purchasing activities through the prism of five perspectives: financial, customer, internal process, supplier, and learning and growth.

The following questions help to identify the critical success factors and specify the objectives for purchasing activities for every out of five P-BSC perspectives:

Financial perspective: How value is created for company's shareholder?

Customer perspective: How value is created for internal and external customer?

Internal process perspective: What internal processes must we excel at in order to create and sustain value for stakeholders?

Supplier perspective: How do our suppliers perform?

Learning and growth: How will we sustain our capability to change and improve purchasing activities?

The key to the sound BSC design is to focus on a few critical parameters and factors defining the company's long-term strategic value creation. For this purpose we create a strategy map that is a visual representation of company's purchasing strategy. The strategy map of company's purchasing activities is presented in Figure 10.

This strategy map provides some specification, required to transform strategic goals into objectives and initiatives on which employee should concentrate and act. It enables us to see how critical factors and objectives, from the point of view of BSC perspectives, integrate and combine to describe ours strategy. The essence of the strategy map is that it clearly shows the cause-and-effect relationships between the objectives.

In the following section of the paper we set the objectives and KPIs for each of P-BSC perspective.

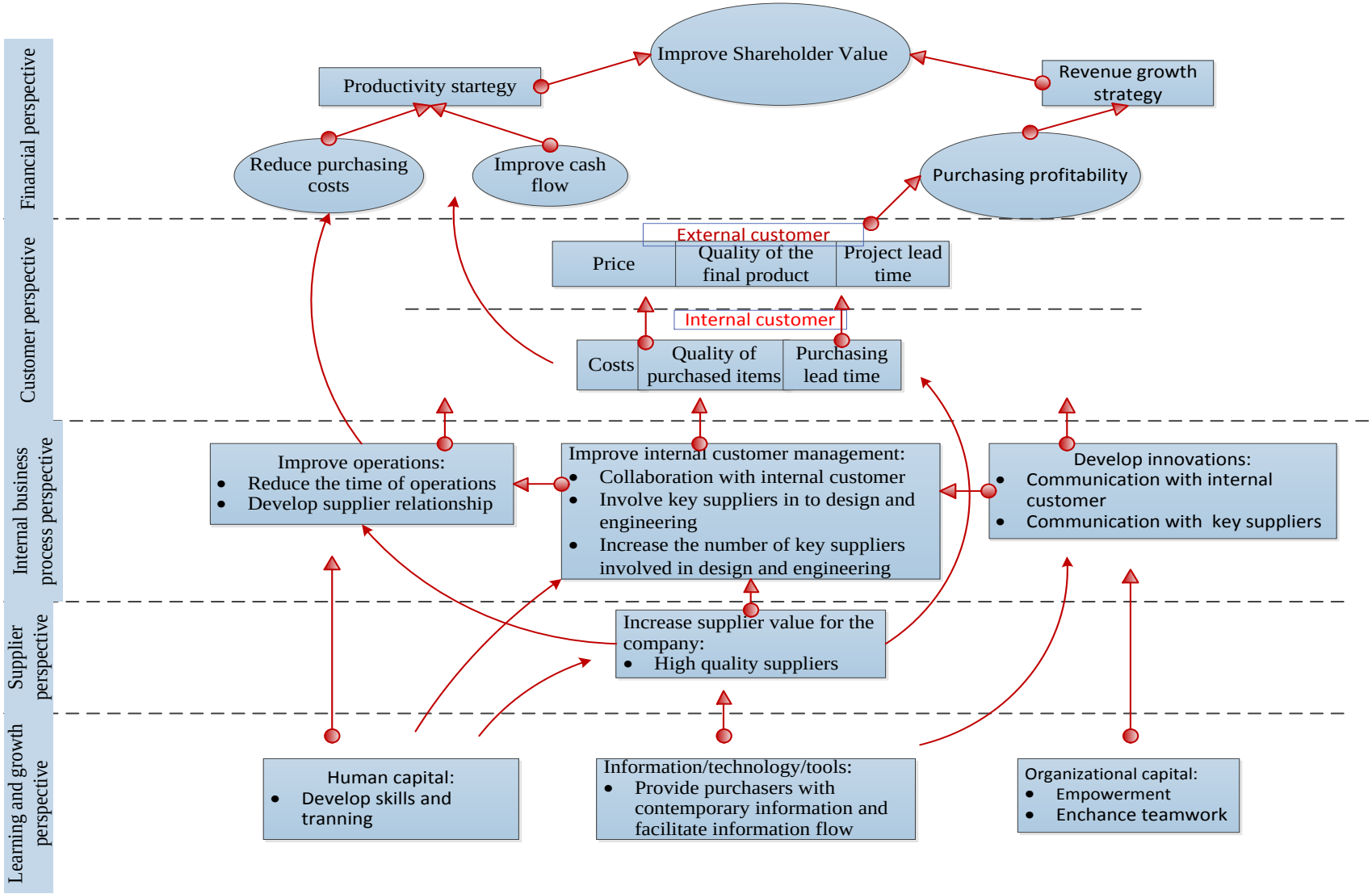

Figure 10: Strategy map (Source: own display)

7.2 Purchasing balanced scorecard perspectives

The analysis of existing KPIs of purchasing and supply management was conducted with the purpose to create an appropriate measures for purchasing and supply performance evaluation of a case study company. The analysis of KPIs in purchasing is based on the review of such literature sources as: van Weele (2014), Rebolledo and Jobin (2013), Tate et al. (2012), Hartmann et al. (2012), Pohl and Förstl (2011), Carter et al. (2005), Axelsson et al. (2002).

7.2.1 Financial perspective

Aker as an owner (100 % of shares) of Midsund Bruk AS, has a financial interest in high performance of the company. Aker concentrates on its company's long-term growth and competitive market position. For Midsund Bruk AS it means to ensure sustainable value creation for their shareholder by the means of increasing productivity and revenue growth.

The objectives and KPIs of the financial perspective of P-BSC are provided in Table 5.

Table 5: Financial perspective of P-BSC

Strategic theme	Objectives	KPI	KPI description
Productivity strategy	Reduce purchasing operating cost	Purchasing operating cost ratio = Total purchasing operating cost / Project revenue	This measure identifies the efficiency of the purchasing management.
	Improve cash flow	Days in Accounts Payable = (Average accounts Payable * Days in the period) / Project purchases	This KPI reflects the average number of days it takes for a company to pay its suppliers. High ratio may indicates problems with paying suppliers. Too low ratio shows that company does not take advantage of purchase credit
Revenue growth strategy	Increase profitability of purchasing activities	Purchasing Return on investment (ROI) = Total purchasing savings / Total purchasing cost	ROI in purchasing defines the profitability of purchasing operations

Source: own display

In the P-BSC, the *financial perspective* is considered to be the ultimate – everything is done to improve financial results. Financial performance measures reflect weather developed strategy, its implementation and execution resulted in bottom line improvement. From this perspective there are two ways to improve the bottom line:

- Be more productive i.e. spend less.
- Earn more or grow in revenue.

The revenue growth strategy is perused since we consider purchasing function not only as a service functions. Purchasing directly contributes to quality and service (project time reduction) and therefore affects the revenue by attracting new customers and retaining existing. In our case, financial perspective involves productivity strategy and revenue growth strategy.

7.2.2 Customer perspective

With respect to the KPIs, which relate to the level of customer satisfaction, we can distinguish between an internal customer (design and engineering department, manufacturing, financial department) and external customer (the end product customer). The objectives and KPIs of the customer perspective are presented in Table 6.

The *customer perspective* shows purchasing function contribution to value creation for internal and external customer. The company uses integral performance measure (or satisfaction score) reflecting customers' satisfaction.

Based on the priorities of key attributes for the external customer provided by the purchasing manager of Midsund Bruk AS, it will be logical to assume that the weights can be the following:

- Quality – 0,5
- Project lead time – 0,3
- Price of the end product – 0,2

As for internal customer weights they may look as follows:

- Quality – 0,4
- Purchasing lead time – 0,3
- Cost – 0,2
- Flexibility – 0,1.

Table 6: Customer perspective of P-BSC

Strategic theme	Objectives	KPI	KPI description
Enhance external customer satisfaction	Increase external customer satisfaction by: • increasing quality of the end product; • decreasing lead time of the project; • cutting the project price	External customer satisfaction (ECS) score = quality score*quality weight + project lead time score*time weight + project price score *price weight	This indicator measures general external customer level of satisfaction, based on weighted attributes as: quality of the end product, project lead-time and price
Enhance internal customer satisfaction	Increase internal customer satisfaction by: • maximizing the quality of the purchased items; • decreasing purchasing delivery lead time; • minimizing purchasing cost; • increasing flexibility of purchasing operations	Internal customer satisfaction (ICS) score = quality score*quality weight + purchasing delivery lead time score*time weight + purchasing cost score *cost weight + flexibility score * flexibility weight	Internal customer satisfaction (ICS) score shows the level of internal customer satisfaction based on weighted attributes as: quality of purchased items, purchased delivery lead-time, purchasing cost and flexibility

Source: own display

7.2.3 Internal processes perspective

Internal business process perspective reflects the processes in which the company must excel in order to increase customers satisfaction (and thus affecting revenue growth), and costs reduction (and thus improving productivity in the financial perspective). Here we concentrate on three themes:

- Improve the purchasing operations management. This theme reflects improvement of day-to-day activities performed by purchasing. The objectives are:
    1. Reduce specification processing time.
    2. Reduce the time for supplier evaluation and selection processes.
    3. Develop strategic relationships with key suppliers.

The first two objectives directly affect the productivity. The third objective implies long term and reliable relationships with suppliers that in turn positively affects purchasing costs, lead times, reliability of deliveries etc.

- Improve internal customer management process. This theme is important since the cooperation with design and engineering (of both purchases and suppliers) significantly saves time and leads to costs reduction (due to suppliers' suggestions on the characteristics of the purchased items). The objectives are:
    1. Increase collaboration between purchasing, design and engineering stuff.
    2. Increase the number of key suppliers involved in design and engineering process.
    3. Increase the degree of involvement of each key supplier into design and engineering process.

These objectives influence purchasing costs, project time and quality of the purchased materials, and thus make the impact on productivity and on the revenue by increasing customer satisfaction.

- Develop innovations in communication processes. This theme reflects how the company implements information technology (IT) innovations in order to improve its operations and facilitate more effective communication between employees, business units within the company and as well with suppliers. The objectives are:
    1. Improve the communication process with internal customer.
    2. Enhance the communication process with key suppliers.

The results are: reduced time (communication with design and engineering, suppliers; documents turnover etc.), availability of up to date information, improved quality of decisions caused by IT use, reduction of the number of mistakes and misunderstandings, etc. The achievement of these goals leads to increased productivity and create value for customers.

The objectives and KPIs of the internal process perspective of P-BSC are presented in the Table 7.

Table 7: Internal process perspective of P-BSC

Strategic theme	Objectives	KPI	KPI description
Improve the purchasing operations	Reduce specification processing time	% of specification processing time in the average order preparation time = Specification processing time / Average order preparation time	This KPI measures the contribution of specification processing time to the average order preparation time
	Reduce the time for supplier evaluation and selection processes	% of the time spend on supplier selection and evaluation in the average order preparation time = (Time for supplier evaluation + Time for supplier selection) /Average order preparation time	This ratio indicates the contribution of the supplier evaluation and selection time to the average order preparation time
	Develop strategic relationships with key suppliers	% of long-term contracts with key suppliers = Number of long-term contracts with key suppliers / Total number of contracts	This ratio shows how preferable long-term collaborative relationships with key suppliers compare to market based type of relationships
Improve internal customer management process	Increase collaboration between purchasing and engineering department	Purchasing WTE (Whole-time equivalent) = Purchasing time spent on the project design and engineering / Project lead time	Purchasing WTE indicates the degree of purchasing involvement into design and engineering process
	Increase the degree of involvement of each key supplier into design and engineering process	Supplier WTE = Suppliers' time spent on the project design and engineering /Project lead time	Supplier WTE shows the degree of involvement of key suppliers into design and engineering process
	Increase the number of key suppliers involved in design and engineering process	% of key suppliers involved in design and engineering process = Number of key suppliers involved in design and engineering process / Total number of key suppliers	This KPI shows the extent of key suppliers' participation in design and engineering process
Develop innovations in communication processes	Improve the communication process with internal customer	ROI of communication with internal customer = (gain – cost) / cost	This indicator shows the impact of investments in information systems on communication processes between functional units of the company
	Enhance the communication process with key suppliers	ROI of communication with key suppliers = (gain – cost) / cost	The ROI shows the impact of investments in information systems on communication processes between the company and its key suppliers

7.2.4 Supplier perspective

Traditionally, there are four perspectives in the BSC. But we incorporate the fifth one – the *supplier perspective*, since we emphasize the influence of suppliers' performance on purchasing operations and results, and on the customer value propositions.

As it was mentioned in section 6.1 of this thesis, the company has their own system of supplier performance evaluation that is based on the six criteria: on-time delivery of materials (1), on-time delivery of documentation (2), quality of received materials (3), quality of received documentation (4), collaboration and responsiveness (5) and HSE indicator (6). This system of supplier performance evaluation is obligatory for companies, which operate in oil and gas industry. During the process of setting KPIs into the P-BSC for supplier perspective we should take into account the company's indicator of supplier performance evaluation (overall score).

The objective and KPI of the supplier perspective of P-BSC are presented in the Table 8.

Table 8: Supplier perspective of P-BSC

Strategic theme	Objectives	KPI	KPI description
Increase supplier value for the company	Source from high quality suppliers	Overall score (%) of supplier performance evaluation	KPI provides the company's assessment of suppliers performance. It is based on such criteria as: • on-time delivery of materials, • on-time delivery of documentation, • quality of received materials, • quality of received documentation, • collaboration and responsiveness, • HSE indicator.

Source: own display

Strategic theme of supplier perspective of P-BSC is to increase supplier value for the company. For this purpose suppliers monitoring and evaluation is organized. The goal is to *source from high quality suppliers*. The quality of suppliers is defined by the rate of overall score of supplier performance evaluation.

7.2.5 Growth and learning perspective

Finally, *learning and growth perspective* describes intangible assets required to achieve strategic goals and explains how these assets will be utilized. It is obvious, that some resources are required to execute our strategy and therefore we have to define which and how they will be used.

The objectives, KPIs and their description of learning and growth perspective are presented in the Table 9.

Table 9: Learning and growth perspective of P-BSC

Strategic theme	Objectives	KPI	KPI description
Human capital management	Improve skills of purchasing stuff by the means of training programs	Extent of training = Total hours of training / Number of employee	KPI shows the number of training hours for each employee
Investing in new information system which facilitate relationships with stakeholders	Provide purchasers with contemporary information and facilitate information flow	% and number of internal customers and suppliers that are using IT system	Greater number of IT system users improves information exchange for internal customer and suppliers
Organizational capital management	Enhance teamwork	Purchasers' satisfaction of teamwork score	KPI shows how purchasers are satisfied about collaboration with all functional departments of the company
	Employee empowerment	The number of employees whose remuneration is connected to KPIs values	This KPI is very crucial to the company, since it reflects how employees motivation is connected to the KPIs values and as follows performance

Source: own display

The strategic themes of this perspective are:

- Human capital. The objective is to improve skills of purchasing stuff by the means of training programs. Employees should be aware of the company's strategy, goals and initiatives and as well possess skills required for the fulfillment of their duties. Training is essential for implementation of new programs, IT solutions etc.
- Information capital. The objective is to provide purchasers with contemporary information and facilitate information flow within the company's departments

and between purchasers and suppliers. This goal requires the development of the entire IT platform for purchasing and design and engineering department.

- Organization capital. This theme reflects the company's ability to organize employee to be more productive. The objectives are:
  1. Improve teamwork. This favors internal and external collaboration, cross-functional integration etc.
  2. Empower employee. This objective involves connecting the employees' remuneration to the BSC.

7.3 Cause and effect analysis

During the process of setting KPIs it is important to define the cause and effect relationships between KPIs and performance. Such relationships may be clear or unclear. Clear relationships are those which may be defined by computations and which enable the company to calculate the KPI's values. Unclear relationships between KPIs are related to different categories. But it is also crucial to establish the cause and effect relationships between KPIs themselves. Since relationships between KPIs define the structure of the system and help to balance the scorecard.

The diagram showing cause and effect relationships between KPIs is presented in Figure 11.

Determination of the relationships between KPIs is supported by the following:

- The presence of logical interrelation between KPIs
- The presence of functional relations between KPIs and the ability to describe this relations mathematically
- Possibility of setting correlation between KPIs by correlation coefficient

The cause and effect relationships between KPIs is not always possible to describe mathematically. For example, achievement of high performance in collaboration between purchasing and design (internal business process perspective) may not be directly attributed to the extent of training (learning and growth perspective). But in reality, training employee to be more productive in teamwork may leads to better collaboration.

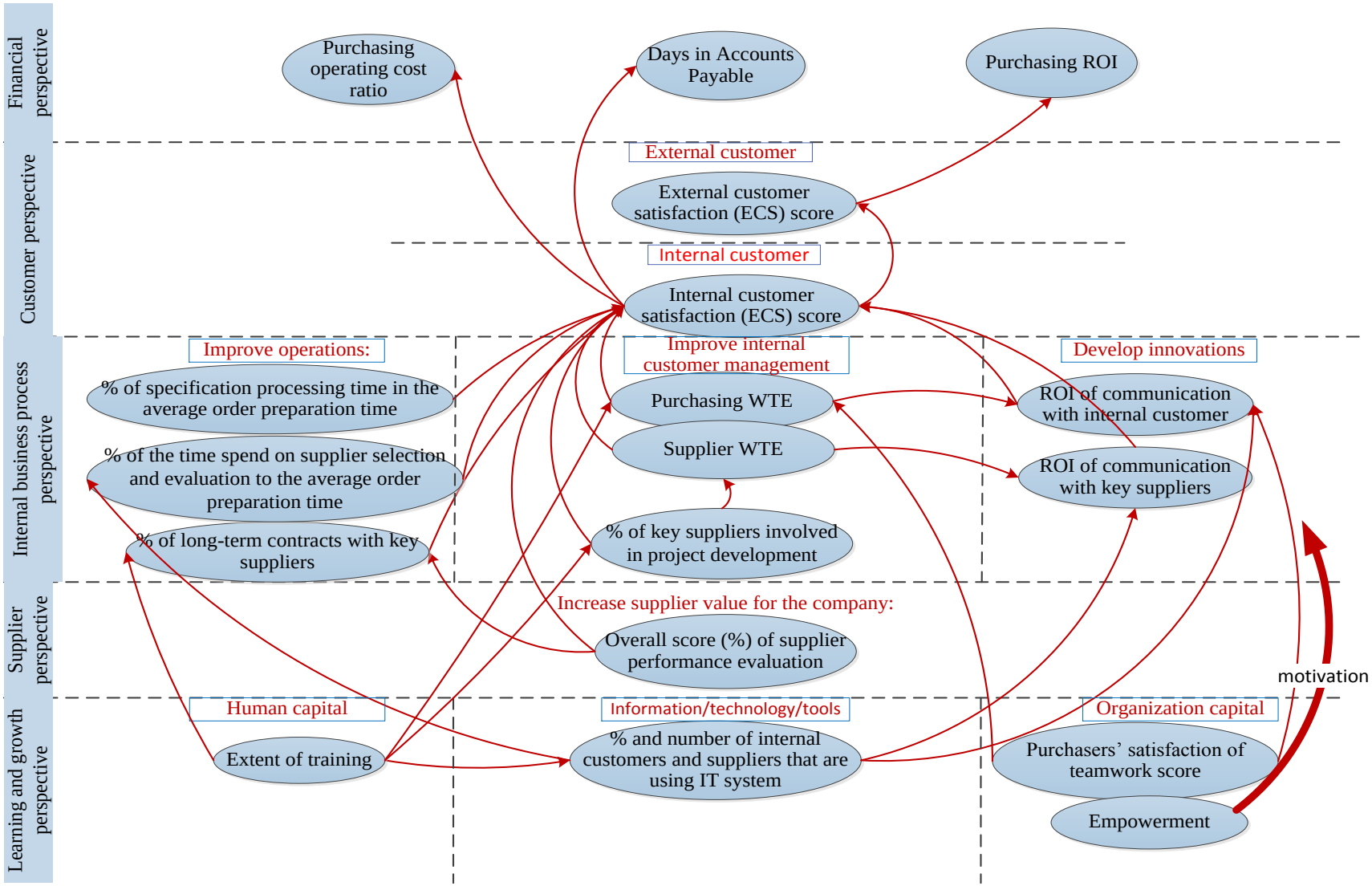

Figure 11: Cause-and effect diagram (Source: own display)

7.4 Purchasing balanced scorecard

In this sections we summarize the objectives and KPIs of the five perspectives into the P-BSC. Complete P-BSC involves in addition setting targets and initiatives. Concerning the targets we omit this step. The targets should be defined during the process of P-BSC implementation and approved by the company's managers. While the developed P-BSC was submitted to company's purchasing manager for preliminary assessment with the aim of possible amendments and suggestions.

The final step of P-BSC development is to ensure that all the initiatives, required to achieve set objectives, are in place. It is crucial that initiatives strongly support achievement of improvements for strategic objectives, otherwise poor initiatives will lead to the waste of resources. The formulation of initiatives is based on the required for KPIs sources of data, training programs of employees associated with changes, and information system and tools, etc.

The P-BSC is presented in the Table 10.

Table 10: P-BSC

Financial perspective		
Objectives	**KPIs**	**Initiatives**
Reduce purchasing operating cost	Purchasing operating cost ratio	
Improve cash flow	Days in Accounts Payable	
Increase profitability of purchasing activities	Purchasing ROI	
Customer perspective		
Objectives	**KPIs**	**Initiatives**
Increase external customer satisfaction	External customer satisfaction (ECS) score	
Increase internal customer satisfaction	Internal customer satisfaction (ICS) score	Questionnaires and surveys of the internal customer on purchasing performance
Internal processes perspective		
Objectives	**KPIs**	**Initiatives**
Reduce specification processing time	% of specification processing time in the average order preparation time	Develop standard form of technical specifications for purchased items
Reduce the time for supplier evaluation and selection processes	% of the time spend on supplier selection and evaluation in the average order preparation time	Incorporate supplier evaluation system into electronic supplier database

Table 10 (continuation)

Internal processes perspective		
Objectives	**KPIs**	**Initiatives**
Develop strategic relationships with key suppliers	% of long-term contracts with key suppliers	Develop training and change management program
Increase collaboration between purchasing and engineering department	Purchasing WTE (Whole-time equivalent)	Develop training and change management program
Increase the degree of involvement of each key supplier into design and engineering process	Supplier WTE	Define the key areas where a suppler may contribute to business process and how
Increase the number of key suppliers involved in design and engineering process	% of key suppliers involved in design and engineering process	Develop key supplier definition techniques
Improve the communication process with internal customer	ROI of communication with internal customer	Training to the new IT system
Enhance the communication process with key suppliers	ROI of communication with key suppliers = (gain – cost) / cost	Develop Electronic Data Interchange system
Supplier perspective		
Objectives	**KPIs**	**Initiatives**
Source from high quality suppliers	Overall score (%) of supplier performance evaluation	Provide continuous evaluation of suppliers and update suppliers score in the database
Growth and learning perspective		
Objectives	**KPIs**	**Initiatives**
Improve skills of purchasing stuff by the means of training programs	Extent of training	Develop and implement employee skill training programs
Provide purchasers with contemporary information and facilitate information flow	% and number of internal customers and suppliers that are using IT system	Create entire IT system between purchases, design and manufacturing
Enhance teamwork	Purchasers' satisfaction of teamwork score	Program facilitating effectiveness in teams
Employee empowerment	The number of employees whose remuneration is connected to KPIs	Develop motivation system directly linked to performance measures

Source: own display

8. DISCUSSIONS AND RECOMMENDATIONS

In this section we provide the discussions of challenges faced during the research, give recommendations to the company on purchasing, and supply performance evaluation.

8.1 Discussions

During the process of development of P-BSC as a purchasing and supply performance evaluation system of a case study company, the following obstacles were encountered:

1. The lack of continuous cooperation with purchasing manager of Midsund Bruk AS resulted in challenges during the process of P-BSC development. It should be noted that the development of P-BSC requires theoretical knowledges, skills and experience in scorecarding process and as well cooperation with the company's purchasing manager.

2. Unclear strategy, vision and mission. The methodology of BSC development requires definition and clarification of the company's vision, mission and strategy. From the practical point of view, it is not an easy task. The clear formulation of the strategy, vision and mission of a case study company took time and efforts. However, it is important step in the BSC development process due to its influence on the results of the performance evaluation.

3. Low quality of the collected data. Purchasing requires some data from design and engineering department. Due to differences in the description of the same type of data or items in purchasing, and design and engineering, the data analysis was seriously complicated and narrowed.

4. Identifying the key performance measurements. One of the main requirement to the BSC is that the number of KPIs should not exceed 20-25. Moreover, the measurements in the BSC should reflect the objectives of the performance evaluation and be linked to the company's strategy. From the practical point of view, it is difficult to define the right indicator as the best performance measurer.

5. Establishment of the cause-and-effect relationships between indicators. The problem was to define direct and significant linkages on the cause-and-effect map. The map clarifies the dependency between measures and helps to understand their nature and identify their coherence and consistency.

8.2 Recommendations

In this section we provide recommendations for P-BSC implementation in the case study company.

First of all, we recognize the importance of the objective performance evaluation of the purchasing and supply management of the case study company. For this reason, we strongly recommend to the company's management to continuously review and update the indicators in P-BSC. Furthermore, it is not sufficient just to develop and implement BSC. The developed P-BSC should be integrated into the company's management system and supported by information technologies. The connection P-BSC to the company's information system allows for evaluation of the performance in real-time and contributes to rapid decision making.

The technical specifications should be created correctly and explain customer requirements in a detailed way. On the one hand, the detailed technical specifications allow suppliers to deliver the right item needed for the project. On the other hand, too detailed specification increases order preparation time during theirs processing by purchasers and may significantly reduce the number of potential supplier.

Items with long lead-time of delivery should be specified at an early stage of the project design process. Earlier involvement of purchasing specialists in tendering and design process can reduce lead-time and costs.

In the company, which operates in ETO logistic environment, purchasing should be viewed as a strategic function, which may lead not only to purchasing cost reduction but also can create value for stakeholders. Therefore, purchasing objectives should be clearly established and aligned to the company's corporate strategy. In addition to that, to enhance purchasing efficiency, strong collaboration with other internal business units (design and engineering, manufacturing, finance, etc.) should be facilitated. For this purpose the company should preferably invest in innovate IT.

ETO manufacturing normally implies strong dependence on suppliers. In order to create value for internal customer and be cost efficient, purchasing should take advantage of establishing long-term partnership with key suppliers. The important role of suppliers for purchasing requires creation of suppliers' database and permanent monitoring of their performance. Furthermore, involvement of suppliers into design and engineering process may significantly save project lead-time, reduce cost and increase quality of purchased items.

9. CONCLUSIONS

There are several ways the purchasing can significantly contribute to business success. First, efficient purchasing policies can seriously improve sales margins via costs savings. All the money saved by purchasing can be considered as contribution to the bottom line. Second, through efficient negotiations with suppliers, purchasing may contribute to the reduction of the working capital. Third, supplier relationship management may contribute to the company's innovation processes. Nowadays, many companies are dependent on their suppliers and therefore the value of purchasing here is to create global supplier base to put the company into better competitive position. Sourcing worldwide and establishing reliable relationships with suppliers may have significant impact on the company's bottom line.

In this thesis we conducted a case study dedicated to the development of purchasing management system for a real company based on the BSC concept. The BSC is a strategic management system which, compared to the traditional performance measurement systems, combines both financial and non-financial indicators, leading and lagging measures, short term and long term objectives, internal and external performance perspectives.

Especial feature of the studied problem is that the case company operates in ETO logistic environment. The BSC is not a new approach, but the literature related to the development and implementation of BSC for purchasing performance evaluation is quite scarce and is mainly covers traditional application of BSC. Nevertheless, we studied general methodology on BSC development, theory on purchasing performance evaluation, the KPI concept, and the literature dedicated to the role of purchasing in ETO manufacturing. In addition, we studied existing literature dedicated to application of the BSC in purchasing, procurement and supply chain management.

Several interviews were conducted with the company's purchasing manager with the aim of data gathering on the company's purchasing operations. In this study, we considered purchasing not just as a service function, but also as a strategic value adding. For this reason, we studied the relationships of purchasing with design and engineering, and suppliers to find out how it may benefit from closer cooperation with them.

To reveal the environment of the company's purchasing activities, the SWOT analysis was conducted. The results of the SWOT analysis clarified the strengths and opportunities of purchasing activities as well as threats and weaknesses, which we aimed to eliminate. The most critical threats and weaknesses for the company's purchasing activities are: complexity of projects, high level of dependency on suppliers, inefficient performance

measurement system, poor collaboration with design and engineering, and suppliers. Taking into account these weaknesses, we defined critical success factors for purchasing and set objectives, underpinning their success.

The most difficult part of the research was to define KPIs, which are linked to objectives and success factors by the cause-and-effect relationships.

Application of BSC in its traditional way implies evaluation of performance through the prism of four perspectives: financial, customers, internal business processes, and learning and growth. Defined objectives require intensive cooperation with supplier due to ETO environment. For this reason we came to conclusion that four traditional perspectives are insufficient for ours purchasing management system and defined the fifth – suppliers perspective, which reflects supplier performance.

Practical findings of the paper are summarized in the BSC that involves objectives and corresponding to them KPIs. To ensure the achievement of established objectives we formulated a set of initiatives underpinning these objectives. The essence of initiatives is in attraction of company's intangible resources for the needs of the development of the purchasing performance evaluation system.

The preliminary P-BSC with defined objectives and KPIs of the purchasing and supply management activities of the case study company was presented to purchasing manager of Midsund Bruk AS. Based on comments and feedback that we received from the manager, P-BSC was revised and the appropriate amendments have been made.

The suggested P-BSC can be viewed from two perspectives: as a contribution to the theoretical basis of the BSC concept for companies operating in ETO logistic environment and as a practical tool for improving purchasing management system at the case company. First, it can be used as a general overview of purchasing system evaluation in the ETO manufacturing industry. Secondly, the developed P-BSC model may be of a high practical interest to the managers of companies which operate in ETO environment. These companies can use the developed P-BSC model as a theoretical framework for creation of their own purchasing management system.

10. LIMITATIONS AND FUTURE RESEARCH

As a limitation should be noted that current research considered to a single case study. The BSC approach was adopted to purchasing operations and supply management of one certain company. Moreover, we unable to trace the progress of P-BSC implementation in company's management system that helps to evaluate day-to-day purchasing operations.

The following limitations represent the base for further research.

As one of the directions for future research we can suggest the development of the benchmarking network for the purchasing performance evaluation of several companies within the same industry with ETO manufacturing. The values of performance indicators of different companies from the same industry may be compared with the best practice in purchasing and supply management of an etalon company. In this way, it is important to identify the ways of successful performance in purchasing and supply management of an etalon company. This provides possible options and ways for improvements in purchasing operations of other companies.

Another direction for future research can be based on the development of P-BSC for companies which operate in ETO production logistic environment but belong to different industries. In addition, for future research we can propose to develop, analyze and compare P-BSC for companies that use other logistic concepts, such as: make to order, assemble to order, and make to stock. In order to develop P-BSC, this classification of different type of production systems will lead to different purchasing strategies and as a consequence, different objectives and KPIs.

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Appendix

Appendix 1: Interview Questionnaire

(1st interview)

Part 1. General questions about your company:

What is a strategic goal of your company?

How many customers does your company have in Norway and outside?

Which companies are your competitors in Norway, Europe?

What is your company's main competitive advantage?

How many shareholders possess shares in your company equity capital?

Part 2. Questions concerning the production process:

What is a lead-time from design to production product (pressure vessels, storage tanks, steel constructions, subsea equipment, LNG Tanks)?

What is the production lead-time?

What is your company capacity utilization?

Part3. Questions about purchasing operations:

How many people are working at the purchasing department?

What kind of IT does your company use for purchasing operations?

How is organized ordering process, invoicing and payments?

Does your company have purchasing plan and schedule?

Do you have real-time information in the supply chain about your order?

How is organized replenishment of the inventories?

What is the frequency of your orders?

Part 4. Questions about companies' suppliers:

How many suppliers do you have in Norway and outside?

What is the duration of the contract with the supplier in average?

What is more preferable long-term or short-term contract with supplier?

Does your company have deal with 3PL companies (transportation companies)?

What is the level of competition between suppliers?

How did you get information about your supplier companies?

What is the main criteria of choosing the supplier:

a) quality?

b) costs?

c) location?

d) the other?

Which company is your major supplier?

Part 5. Questions concerning the investment to the innovation and learning:

Does your company invest in the employee training?

Does your company invest in new technology?

Does your company invest in the excessive capacities?

(2nd interview)

Part 6. Questions concerning the purchasing and supply activities:

What is the role of purchasing activities in your company?

Can you describe the relationships between purchasing and other departments (design and engineering, manufacturing)?

Is supplier involved in project development?

Do you have purchasing strategy? What is the purchasing strategy of your company?

Can you prioritize purchasing strategic objectives that are you focusing on?

- Delivery
- Quality
- Cost
- Flexibility

Part 7. Questions concerning the purchasing performance measurement:

Does your company have performance measurement system for purchasing?

How do you evaluate purchasing performance (tools, software)?

What measures of purchasing performance are you focusing on and why? Are they sufficient for the evaluation of your company's purchasing performance?

Does your performance measurement system (KPIs) relate to purchasing strategy?

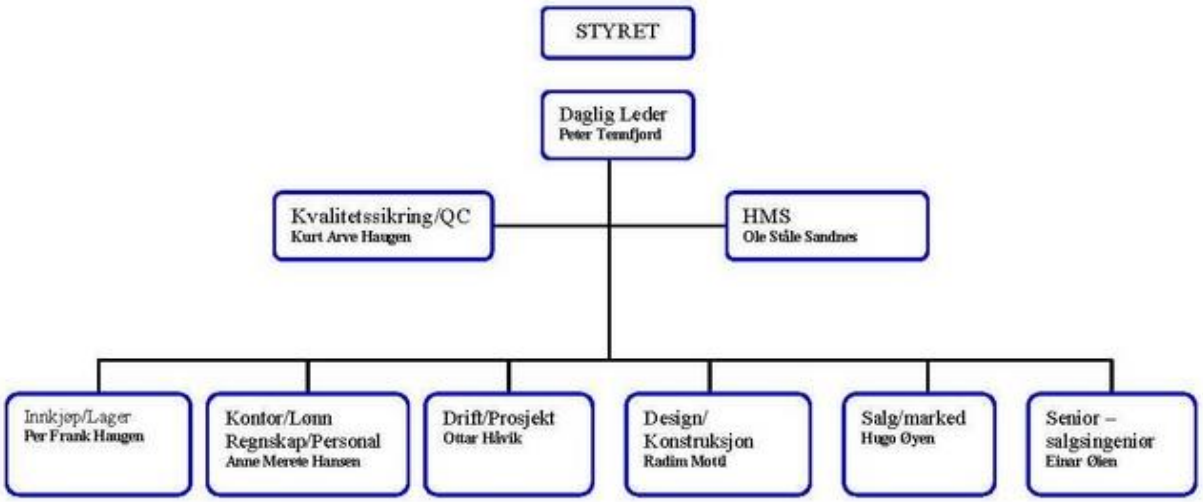
Do you have a report system of purchasing performance evaluation? What is a periodicity of reporting? Who are the recipients of this report?

Does your performance measurements and performance control relate to product groups or suppliers?

Do you have any criteria for the assessment of your suppliers?

Does your company provide feedback to its suppliers?

Appendix 2: Company's organizational structure



Source: Midsund Bruk AS

Appendix 3: ABC analysis of suppliers

Supplier	Sum of Faktura (NOK)	Cumulated sum (NOK)	Cumulated % of sum	ABC group	% of the total number of suppliers	Cumulated number of items	Cumulated % of the number of items	Absolute contribution
Wärtsilä Oil & Gas Systems AS	24861139	24861139	71,591	A		10	2,6%	
Outokumpu Stainless AB, Div. HRP	2672690	27533829	79,287	A	**3,7**	27	7,0%	7,0%
FMC Seperation System B.	2492990	30026819	86,466	B		59	15,4%	
Antonius Vesselheads BV	910500	30937318,79	89,088	B		63	16,4%	
Energy Piping AS	643317	31580636,27	90,941	B		132	34,5%	
S.C. Norsteel International S.R.L	626030	32206665,77	92,743	B		141	36,8%	
Aker Midsund Engineering s.r.o.	574365	32781030,77	94,397	B	**9,26**	147	38,4%	31,3%
Adima Industry AS	259430	33040460,77	95,144	C		153	39,9%	
NST Norge AS	231802,79	33272263,56	95,812	C		175	45,7%	
Tingstad AS	148352,48	33420616,04	96,239	C		190	49,6%	
Fosdalen AS	144406,4	33565022,44	96,655	C		195	50,9%	
Hamworthy Oil And Gas System AS	117500	33682522,44	96,993	C		196	51,2%	
Ruukki Norge AS	102232,39	33784754,83	97,288	C		199	52,0%	
Outokumpu PSC Nordic AB	95680	33880434,83	97,563	C		207	54,0%	
Molab AS	87825	33968259,83	97,816	C		217	56,7%	
Astero	83304	34051563,83	98,056	C		226	59,0%	
Mechanical Design spol s.r.o	81842,4	34133406,23	98,292	C		228	59,5%	
Det Norske Veritas AS	81321	34214727,23	98,526	C		230	60,1%	
DET NORSKE VERITAS CERTIFICATION AS	63550	34278277,23	98,709	C		231	60,3%	
Via Travel Ålesund	62576,49	34340853,72	98,889	C		246	64,2%	
HOLGER HARTMANN AS	54368,75	34395222,47	99,046	C		264	68,9%	
Böhler Welding Group Nordic Sales AB	53878,91	34449101,38	99,201	C		271	70,8%	
Helseth Rør AS	33180	34482281,38	99,296	C		273	71,3%	
Bring Cargo AS	28436	34510717,38	99,378	C		281	73,4%	
Akzo Nobel Coatings AS	17815,42	34528532,8	99,43	C		290	75,7%	
International Maling AS	16600,49	34545133,29	99,477	C		292	76,2%	
Sveiseeksperten AS	15145,6	34560278,89	99,521	C		297	77,5%	
Clemco Norge AS	15050,4	34575329,29	99,564	C		299	78,1%	
Bufab Norge AS avd Oslo	14888	34590217,29	99,607	C		302	78,9%	
Åndal Maskin AS	14762,4	34604979,69	99,65	C		304	79,4%	
***STOPP*ARVID NILSSON NORGE AS	13309,98	34618289,67	99,688	C		309	80,7%	
Bring Cargo AS, Air+Sea	12600	34630889,67	99,724	C		318	83,0%	
Molde Jarnvareforretning AS	11288	34642177,67	99,757	C		327	85,4%	
Pump Tech A/S	8550	34650727,67	99,781	C		329	85,9%	
Amdam Sag & Høvleri AS	8512	34659239,67	99,806	C		330	86,2%	
Bring Logistics AS	8470,2	34667709,87	99,83	C		336	87,7%	
Blø Bygg AS	8186,4	34675896,27	99,854	C		340	88,8%	
Vestpak a.s	7217,2	34683113,47	99,875	C		347	90,6%	
Norsk Stål AS	7128,3	34690241,77	99,895	C		349	91,1%	
IP Huse AS	6288	34696529,77	99,913	C		350	91,4%	
TOOLS Norge AS	5383,16	34701912,93	99,929	C		353	92,2%	
DSV Road AS	4525	34706437,93	99,942	C		358	93,5%	
Vard Group AS	3640	34710077,93	99,952	C		359	93,7%	
ACO KJEMI AS	3324,63	34713402,56	99,962	C		362	94,5%	
Transferd AS	3197	34716599,56	99,971	C		366	95,6%	
Helge Norli AS	2950,4	34719549,96	99,98	C		367	95,8%	
Tess Møre AS	1619,2	34721169,16	99,984	C		372	97,1%	
Svea Finans As	1558,57	34722727,73	99,989	C		375	97,9%	
Bring Cargo AS, Avd div.	1100	34723827,73	99,992	C		377	98,4%	
Brødrene Dahl AS	980	34724807,73	99,995	C		379	99,0%	
Midsund Kro AS	814	34725621,73	99,997	C		380	99,2%	
Nordcarrier AS	490	34726111,73	99,999	C		381	99,5%	
Røberg Byggmarked AS	300	34726411,73	99,999	C		382	99,7%	
Bybudet Håkon Kristengård	200	34726611,73	100	C	**87,04**	383	100,0%	61,6%

Appendix 4: ABC analysis of purchased items

Item	Item number	Sum of Faktura (NOK)	Cumulated sum	Cumulated % of sum	ABC group	Cumulated % of the total number	% of the total number of items	Suppliers ABC rank
Complete VIEC® for inlet and testSeparator for	1	13200000	13200000	38,0112	A	0,26		A
Complete VIEC® for inlet and testSeparator for	2	7200000	20400000	58,7446	A	0,52		A
Complete VIEC® for inlet and testSeparator for	3	2400000	22800000	65,6557	A	0,78		A
Complete VIEC® for inlet and testSeparator for	4	1200000	24000000	69,1113	A	1,04		A
Faktura CD20140973	5	755389	24755389	71,2865	A	1,3		A
Korbbogen head DIN 28013 ID=3400 h1=60mm thk=36mm	6	703791,7	25459180,7	73,3132	A	1,55		B
Plate 37 x 2500 x 11000mm shell no 2+1	8	439020	26375850,7	75,9528	A	2,07		A
40x2250x8200mm	9	322785	26698635,7	76,8824	A	2,33		A
Internals for Test Separator 20-VA0002 Ivar Aasen	10	264860	26963495,7	77,6451	A	2,59		B
Materialforbruk offshore	11	262225	27225720,7	78,4002	A	2,85		B
Plate 37 x 2300 x 11000mm shell no 7	12	203445	27429165,7	78,986	A	3,11		A
Materialforbruk offshore	13	201194,5	27630360,2	79,5654	A	3,37		B
Materialforbruk offshore	15	194688	28020150,7	80,6878	B	3,89		B
Internals for Inlet Separator 20-VA0001 Ivar Aasen	16	189279,9	28209430,6	81,2329	B	4,15		B
Inlet piping simulation	17	188928	28398358,6	81,7769	B	4,4		B
Plate 37 x 2080 x 11000mm shell no 6	18	183870	28582228,6	82,3064	B	4,66		A
Plate 37 x 2000 x 11000mm shell no 4	19	176715	28758943,6	82,8153	B	4,92		A
Plate 37 x 1800 x 11000mm shell no 3	20	159030	28917973,6	83,2732	B	5,18		A
1+1 Baffles for Inlet & Test Separator	21	157932	29075905,6	83,728	B	5,44		B
Materialforbruk offshore	22	157709	29233614,6	84,1822	B	5,7		B
31x3350x6700mm	23	153860	29387474,6	84,6252	B	5,96		A
Materialforbruk offshore	24	141710	29529184,6	85,0333	B	6,22		B
Materialforbruk offshore	25	139535	29668719,6	85,4351	B	6,48		C
Plate 29 x 2370 x 8460mm shell no 5	26	126900	29795619,6	85,8005	B	6,74		A
Plate 29 x 2250 x 8460mm shell no 1	27	121095	29916714,6	86,1492	B	6,99		A
Materialforbruk offshore	28	117500	30034214,6	86,4876	B	7,25		C
Korbbogen head DIN 28013 ID=2600 h1=50mm thk=28mm	29	116478,3	30150692,9	86,823	B	7,51		B
Plate 29 x 2030 x 8460mm shell no 3	30	109215	30259907,9	87,1375	B	7,77		A
Plate 25 x 2500 x 8000mm dobling sadler	31	109215	30369122,9	87,452	B	8,03		A
Plate 37 x 1200 x 11200mm shell no 5 inkl WPT	32	108945	30478067,9	87,7657	B	8,29		A
Internals for Test Separator 20-VA0002 Ivar Aasen	33	108185,6	30586253,6	88,0773	B	8,55		B
Plate 29 x 1980 x 8460mm shell no 2	34	106920	30693173,6	88,3852	B	8,81		A
CFD analyses inlet piping sim inkl inlet dev	35	104960	30798133,6	88,6874	B	9,07		B
Internals for Test Separator 20-VA0002 Ivar Aasen	36	104956,9	30903090,5	88,9897	B	9,33		B
Materialforbruk offshore	37	100040	31003130,5	89,2777	B	9,59		B
Plate 37 x 2000 x 6000mm neck + dobl	38	96930	31100060,5	89,5569	B	9,84		A
	39	96695	31196755,5	89,8353	B	10,1		B
Single Phase liquid distribution	40	95940	31292695,5	90,1116	B	10,36		B
Plate for braketter 10 x 2500 x 8000mm	41	91125	31383820,5	90,374	B	10,62		A
Plate 29 x 1540 x 8700mm shell no 4 inkl WPT	42	85050	31468870,5	90,6189	B	10,88		A
Plate 30 x 2000 x 6000mm neck + dobl	43	78570	31547440,5	90,8451	B	11,14		A
Transport	44	73824,3	31621264,8	91,0577	B	11,4		B
Design review of 630 Ivar Aasen	45	63550	31684814,8	91,2407	B	11,66		C
SANDVIK W22.8.3.L 3,2MM UP TRÅD	46	60060	31744874,8	91,4137	B	11,92		C
Materialforbruk offshore	47	57395	31802269,8	91,579	B	12,18		C
Materialforbruk offshore	48	57122,4	31859392,2	91,7435	B	12,44		C
Materialforbruk offshore	49	54931,2	31914323,4	91,9016	B	12,69		C
Internals for Test Separator 20-VA0002 Ivar Aasen	50	53618	31967941,4	92,056	B	12,95		B
CFD Single face gas distrubition	51	53300	32021241,4	92,2095	B	13,21		B
N31-N32-N33 12"WN 300# RF Sch 40S	52	51206,5	32072447,9	92,357	B	13,47		B
PLATE 40 X 2500 X 7015	53	47702,39	32120150,3	92,4943	B	13,73		C
Ritnr: Mibas NO.630-1116 incl material 70mm 316L	54	45940	32166090,3	92,6266	B	13,99		C
SANDVIK/NST W22.8.3.L 1,00MM MIG	55	44525	32210615,3	92,7548	B	14,25		C
Blind 24" 300# RF	56	44266,43	32254881,7	92,8823	B	14,51		B
Blind 24" 300# RF	57	44266,43	32299148,1	93,0098	B	14,77		B
CFD analyses inlet piping sim inkl inlet dev	58	42872,32	32342020,4	93,1332	B	15,03		B
CFD analyses inlet piping sim inkl inlet dev	59	42496	32384516,4	93,2556	B	15,28		B

Item	Item number	Sum of Faktura (NOK)	Cumulated sum	Cumulated % of sum	ABC group	Cumulated % of the total number	% of the total number of items	Suppliers ABC rank
Materialforbruk offshore	60	42436,8	32426953,2	93,3778	B	15,54		C
Materialforbruk offshore	61	41796	32468749,2	93,4982	B	15,8		C
CFD analyses inlet piping sim inkl inlet dev	62	41592,83	32510342,1	93,618	B	16,06		B
Mechanical Calculations for Internals – per Vessel	63	41000	32551342,1	93,736	B	16,32		B
N1 30" WN 300# RF MSS SP-44 ID=736,6 OD neck 762	64	40947,26	32592289,3	93,8539	B	16,58		B
VOR 16	65	40750	32633039,3	93,9713	B	16,84		A
VLBS-10. Wll- 10 tonn. Mbl- 40 tonn	66	39600	32672639,3	94,0853	B	17,1		C
Materialforbruk offshore	67	39525	32712164,3	94,1991	B	17,36		C
Materialforbruk offshore	68	39405,6	32751569,9	94,3126	B	17,62		C
Ritnr: Mibas NO.630-2247 incl material 70mm 316L	69	35960	32787529,9	94,4162	B	17,88		C
DDU Midsund	70	35750	32823279,9	94,5191	B	18,13		A
Materialforbruk offshore	71	35350	32858629,9	94,6209	B	18,39		B
Materialforbruk offshore	72	33631	32892260,9	94,7177	B	18,65		B
Plate 15 x 2500 x 8000mm	73	32718	32924978,9	94,812	B	18,91		C
M1-M2 24" WN 300# RF Sch 40S	74	32474,01	32957452,9	94,9055	B	19,17		B
M1-M2 24" WN 300# RF Sch 40S	75	32474,01	32989926,9	94,999	B	19,43	15,8	B
Materialforbruk offshore	76	30100	33020026,9	95,0857	C	19,69		C
13 mm. kortlenket kjetting Grade 80. Mbl- 22000 kp	77	28483,2	33048510,1	95,1677	C	19,95		C
Merk. 20VA0001. Total vekt 72110 kg	78	28400	33076910,1	95,2495	C	20,21		C
Materialforbruk offshore	79	28140	33105050,1	95,3305	C	20,47		C
skjæring 1 sett Tegn. 630-01-4221	80	25800	33130850,1	95,4048	C	20,73		C
skjæring 1 sett Tegn. 4221	81	25800	33156650,1	95,4791	C	20,98		C
SANDVIK 15W FLUX	82	25575	33182225,1	95,5527	C	21,24		C
Materialforbruk offshore	83	24940	33207165,1	95,6245	C	21,5		C
36133 bøhler cn 22/9 pw-fd	84	23695,5	33230860,6	95,6928	C	21,76		C
Plate 10 x 2500 x 8000mm	85	21812	33252672,6	95,7556	C	22,02		C
CFD Single face gas distrubition	86	21771,1	33274443,7	95,8183	C	22,28		B
CFD Single face gas distrubition	87	21580	33296023,7	95,8804	C	22,54		B
Inlet piping simulation	88	21248	33317271,7	95,9416	C	22,8		B
CFD Single face gas distrubition	89	21121,36	33338393,1	96,0024	C	23,06		B
Lastesurring, Mbl- 10000 kp. Lengde 14 mtr	90	21000	33359393,1	96,0629	C	23,32		C
SANDVIK/NST W22.8.3.L 1,00MM MIG	91	20475	33379868,1	96,1219	C	23,58		C
Materialforbruk offshore	92	19883,2	33399751,3	96,1791	C	23,83		C
6" S80S PIPE A790 UNS S31803 SMLS	93	19824,48	33419575,8	96,2362	C	24,09		B
DDU Midsund	94	19500	33439075,8	96,2924	C	24,35		A
WPQR 6230	95	18995	33458070,8	96,3471	C	24,61		C
30" 300# BL FLANGE RF A105 MSSP 44 eller 16.47 A	96	18876	33476946,8	96,4014	C	24,87		B
WPQR 6332 10MM BUTTSVEIST PLATE	97	18505	33495451,8	96,4547	C	25,13		C
Materialforbruk offshore	98	18240	33513691,8	96,5072	C	25,39		B
1+1 Baffles for Inlet & Test Separator	99	17762	33531453,8	96,5584	C	25,65		B
4" S80S PIPE A790 UNS S31803 SMLS	100	17294,52	33548748,3	96,6082	C	25,91		B
N7 12" WN 300# RF Sch 40S	101	17068,83	33565817,1	96,6573	C	26,17		B
N2 12" WN 300# RF Sch 20	102	17068,83	33582886	96,7065	C	26,42		B
N3 12" WN 300# RF Sch 20	103	17068,83	33599954,8	96,7556	C	26,68		B
N4 12" WN 300# RF Sch 20	104	17068,83	33617023,6	96,8048	C	26,94		B
48 timer * 350	105	16800	33633823,6	96,8532	C	27,2		B
Mechanical Calculations for Internals – per Vessel	106	16747	33650570,6	96,9014	C	27,46		B
Mechanical Calculations for Internals – per Vessel	107	16600	33667170,6	96,9492	C	27,72		B
Testing	108	16405,4	33683576	96,9964	C	27,98		B
DDU Aker Midsund	109	16400	33699976	97,0437	C	28,24		B
Mechanical Calculations for Internals – per Vessel	110	16247,2	33716223,2	97,0904	C	28,5		B
N3 24" WN 300# RF Sch 40S	111	16237	33732460,2	97,1372	C	28,76		B
LEG TILLEGG	112	15698,78	33748159	97,1824	C	29,02		C
skjæring av 2 plater AA2849	113	15645	33763804	97,2275	C	29,27		C
Materialforbruk offshore	114	14365	33778169	97,2688	C	29,53		B
8" container med låsebeskyttelse	115	14088,95	33792258	97,3094	C	29,79		C
Chartec 7 med herdar	116	14022	33806280	97,3498	C	30,05		C
08-ALU0250HS ALU TRÅD 2,5MM 7KG SPOLER	117	13860	33820140	97,3897	C	30,31		C
WPT 630-02	118	13775	33833915	97,4294	C	30,57		C
WPT 630-01	119	13775	33847690	97,469	C	30,83		C
Materialforbruk offshore	120	13688	33861378	97,5084	C	31,09		C
58984 AVESTA P12-R BASIC 4,00MM	121	13436,13	33874814,1	97,5471	C	31,35		C

Item	Item number	Sum of Faktura (NOK)	Cumulated sum	Cumulated % of sum	ABC group	Cumulated % of the total number	% of the total number of items	Suppliers ABC rank
Sandvik 22.8.3.L 1,00mm migtråd	122	13414,8	33888228,9	97,5858	C	31,61		C
3" S80S PIPE A790 UNS S31803 SMLS	123	13413,75	33901642,6	97,6244	C	31,87		B
2" SCH XXS PIPE A790 UNS S31803 SMLS	124	13283,25	33914925,9	97,6626	C	32,12		B
Extended guaranty 01.09.2018	125	12300	33927225,9	97,6981	C	32,38		B
Bet av fakt.nr 950002494	126	12148,38	33939374,3	97,733	C	32,64		B
LEG TILLEGG	127	11885,92	33951260,2	97,7673	C	32,9		C
N4 18" WN 300# RF Sch 20	128	11441,75	33962701,9	97,8002	C	33,16		B
1402-38-300 Studbolt A320 L7/A194 GR 7 HDG	129	11403,84	33974105,8	97,8331	C	33,42		C
Single Phase liquid distribution	130	10790	33984895,8	97,8641	C	33,68		B
N2 16" WN 300# RF Sch 10	131	10650,69	33995546,5	97,8948	C	33,94		B
N1 16" WN 300# RF Sch 10	132	10650,69	34006197,2	97,9255	C	34,2		B
N7 16" WN 300# RF Sch 10	133	10650,69	34016847,8	97,9561	C	34,46		B
Flange Slip On- 3¨ #150	134	10500	34027347,8	97,9864	C	34,72		B
5021026 AGFA D5 90M X 10CM PB FILM ROLLPACK	135	10490	34037837,8	98,0166	C	34,97		C
Materialforbruk offshore	136	10320	34048157,8	98,0463	C	35,23		C
N14-N15-N16A-N16B 4" WN 300# RF Sch 80S	137	9753,62	34057911,5	98,0744	C	35,49		B
Spare 4" WN 300# RF Sch 80S	138	9753,62	34067665,1	98,1025	C	35,75		B
Long.Wave-Dual element probe 70°TRL2-Aust-2 18-14	139	9750	34077415,1	98,1305	C	36,01		C
Long.Wave-Dual element probe 45°TRL2-Aust-2 10-18	140	9750	34087165,1	98,1586	C	36,27		C
Materialforbruk offshore	141	9464	34096629,1	98,1859	C	36,53		B
Skjæring 1 sett tegn. 4245	142	9228	34105857,1	98,2125	C	36,79		C
Materialforbruk offshore	143	9137	34114994,1	98,2388	C	37,05		C
Materialforbruk offshore	144	8762,4	34123756,5	98,264	C	37,31		C
N5 10" WN 300# RF Sch 40S	145	8660,82	34132417,3	98,2889	C	37,56		B
Materialforbruk offshore	146	8620	34141037,3	98,3138	C	37,82		C
HARD TRE 3"X6" LENGDE 1900MM	147	8512	34149549,3	98,3383	C	38,08		C
Merk. 20VA0002. Total vekt 37047 kg.	148	8500	34158049,3	98,3627	C	38,34		C
42,5 tonn,s H- Sjakkel	149	8400	34166449,3	98,3869	C	38,6		C
Materialforbruk offshore	150	8218	34174667,3	98,4106	C	38,86		B
Flange Slip On- 2¨ #150	151	8100	34182767,3	98,4339	C	39,12		B
EL-USB-250 0-250 Bar USB trykk transmitter	152	7900	34190667,3	98,4567	C	39,38		C
SANDVIK 15W FLUX	153	7875	34198542,3	98,4794	C	39,64		C
Kjettingstrammer (jekk) for 13 mm. kjetting	154	7680	34206222,3	98,5015	C	39,9		C
N27 8" WN 300# RF Sch 40S	155	7649,58	34213871,9	98,5235	C	40,16		B
N34 8" WN 300# RF Sch 40S	156	7649,58	34221521,5	98,5455	C	40,41		B
N5 8" WN 300# RF Sch 40S	157	7649,58	34229171	98,5676	C	40,67		B
N32 8" WN 300# RF Sch 40S	158	7649,58	34236820,6	98,5896	C	40,93		B
N16ABC 4" WN 300# RF Sch 80S	159	7316,85	34244137,5	98,6106	C	41,19		B
LEG TILLEGG	160	7008,89	34251146,4	98,6308	C	41,45		C
ØYEBOLT IHHT TILBUD PÅ PDF FIL 633-01-1530	161	6888	34258034,4	98,6507	C	41,71		C
DDU Aker Midsund	162	6698,8	34264733,2	98,67	C	41,97		B
2" SCHXXS PIPE A790 UNSS31803	163	6676,4	34271409,6	98,6892	C	42,23		B
Materialforbruk offshore	164	6656	34278065,6	98,7084	C	42,49		C
58982 AVESTA P12-R BASIC 3,2	165	6526,38	34284591,9	98,7271	C	42,75		C
DDU Midsund	166	6500	34291091,9	98,7459	C	43,01		A
DDU Aker Midsund	167	6498,88	34297590,8	98,7646	C	43,26		B
WN 3" 600# RTJ sch 80S	168	6384	34303974,8	98,783	C	43,52		B
VALSING AV PLATER	169	6288	34310262,8	98,8011	C	43,78		C
N11-N12-N13A-N13B 3" WN 300# RF Sch 80S	170	6230,57	34316493,4	98,819	C	44,04		B
Spare 3" WN 300# RF Sch 80S	171	6230,57	34322724	98,837	C	44,3		B
Materialforbruk offshore	172	5937,6	34328661,6	98,854	C	44,56		C
Materialforbruk offshore	173	5749,26	34334410,8	98,8706	C	44,82		C
SANDVIK W22.8.3.L 3,2MM UP TRÅD	174	5460	34339870,8	98,8863	C	45,08		C
Materialforbruk offshore	175	5452,5	34345323,3	98,902	C	45,34		C
12" RØR R1641 CHARPY-55 MÅ TAS I SVEIS	176	5130	34350453,3	98,9168	C	45,6		C
Materialforbruk offshore	177	5051	34355504,3	98,9313	C	45,85		C
8502435243 AROSTA 4462 2,5	178	5049,6	34360553,9	98,9459	C	46,11		C
8502435243 AROSTA 4462 2,5	179	5049,6	34365603,5	98,9604	C	46,37		C
Materialforbruk offshore	180	5040	34370643,5	98,9749	C	46,63		C
Extended guaranty 01.09.2018	181	5024,1	34375667,6	98,9894	C	46,89		B
59115 Avesta 630	182	4879,5	34380547,1	99,0035	C	47,15		C
N9-N10 4" WN 300# RF Sch 80S	183	4876,81	34385423,9	99,0175	C	47,41		B
N14-N15 4" WN 300# RF Sch 80S	184	4876,81	34390300,7	99,0315	C	47,67		B
Intergard 269 red	185	4875,2	34395175,9	99,0456	C	47,93		C
Extended guaranty 01.09.2018	186	4874,16	34400050,1	99,0596	C	48,19		B
20VA001 N27B 8" 300# blindflens	187	4825	34404875,1	99,0735	C	48,45		B
20VA002 N32B 8" 300# blindflens	188	4825	34409700,1	99,0874	C	48,7		B
N13ABC 3" WN 300# RF Sch 80S	189	4672,93	34414373	99,1009	C	48,96		B
Materialforbruk offshore	190	4563	34418936	99,114	C	49,22		B
8502435176 AROSTA 4462 3,2	191	4400,6	34423336,6	99,1267	C	49,48		C
24"x300# RF Camprofile 316+FG 4,3mm ASME B16.20	192	4293	34427629,6	99,139	C	49,74		C

Item	Item number	Sum of Faktura (NOK)	Cumulated sum	Cumulated % of sum	ABC group	Cumulated % of the total number	% of the total number of items	Suppliers ABC rank
Bolts 20VA0001/ HDG/ M30x150mm + 32 Off M30 Nuts	193	4080	34431709,6	99,1508	C	50		C
DMC-D30A FREMKALLER	194	4068	34435777,6	99,1625	C	50,26		C
311334 AKSLING Ø50 6M	195	4057,9	34439835,5	99,1742	C	50,52		C
Materialforbruk offshore	196	4048,52	34443884,1	99,1858	C	50,78		C
Materialforbruk offshore	197	3968	34447852,1	99,1973	C	51,04		C
Materialforbruk offshore	198	3934,63	34451786,7	99,2086	C	51,3		C
Bolts 20VA0002/ HDG/ M24x150mm + 32 Off M24 Nuts	199	3920	34455706,7	99,2199	C	51,55		C
IEA-10917B MÅLEBAND 20M	200	3900	34459606,7	99,2311	C	51,81		C
N6 6" WN 300# RF Sch 80S	201	3849,25	34463455,9	99,2422	C	52,07		B
N6 6" WN 300# RF Sch 80S	202	3849,25	34467305,2	99,2533	C	52,33		B
CWCT ROTABROACH Ø55MM	203	3820	34471125,2	99,2643	C	52,59		C
Materialforbruk offshore	204	3707,2	34474832,4	99,275	C	52,85		C
metalliseringstråd Draht AlMg5 charge 40/3719	205	3640	34478472,4	99,2854	C	53,11		C
Materialforbruk offshore	206	3569	34482041,4	99,2957	C	53,37		C
7830730 SANDVIK 22.8.3L 2,00 TIG	207	3450	34485491,4	99,3057	C	53,63		C
Materialforbruk offshore	208	3395	34488886,4	99,3154	C	53,89		C
Interfine 691 Ral 9002	209	3339,22	34492225,6	99,3251	C	54,15		C
DDU Aker Midsund	210	3320	34495545,6	99,3346	C	54,4		B
Materialforbruk offshore	211	3283	34498828,6	99,3441	C	54,66		C
DDU Midsund	212	3250	34502078,6	99,3534	C	54,92		A
SANDVIK R22.8.3.L 2.00X1000 TIG	213	3250	34505328,6	99,3628	C	55,18		C
Materialforbruk offshore	214	3246	34508574,6	99,3721	C	55,44		C
20224 KERBACK FS271815T	215	3218,4	34511793	99,3814	C	55,7		C
121616 OILPACK 2MM	216	3160	34514953	99,3905	C	55,96		C
136879 gjengestenger M30x1000	217	3128,7	34518081,7	99,3995	C	56,22		C
N11-N12 3" WN 300# RF Sch 80S	218	3115,29	34521197	99,4085	C	56,48		B
Materialforbruk offshore	219	3080,93	34524277,9	99,4174	C	56,74		C
311333 AKSLING Ø45 6M	220	3070,4	34527348,3	99,4262	C	56,99		C
5041034 BYCO D30A FREMKALLER	221	3051	34530399,3	99,435	C	57,25		C
N24-N25A-N25B-N26A-N26B 2" WN 300# RF Sch XXS	222	3017,42	34533416,7	99,4437	C	57,51		B
Materialforbruk offshore	223	2950,4	34536367,1	99,4522	C	57,77		C
Ritnr: Mibas NO.630-1119 incl material 5mm 316L	224	2936	34539303,1	99,4606	C	58,03		C
3" Elbow LR sch 80S	225	2900	34542203,1	99,469	C	58,29		B
Materialforbruk offshore	226	2851	34545054,1	99,4772	C	58,55		C
20210 KERBACK RD1002T	227	2728,8	34547782,9	99,485	C	58,81		C
Materialforbruk offshore	228	2722,59	34550505,5	99,4929	C	59,07		C
IEA-10917A15 MÅLEBAND 15 METER	229	2700	34553205,5	99,5007	C	59,33		C
CHARPYTESTING AV RØR R1644 -55GR HEAT 301070	230	2610	34555815,5	99,5082	C	59,59		C
Materialforbruk offshore	231	2578,49	34558394	99,5156	C	59,84		C
Ritnr: Mibas NO.630-1115 incl material 2mm 316L	232	2500	34560894	99,5228	C	60,1		C
Extended guaranty 01.09.2018	233	2490	34563384	99,53	C	60,36		B
Materialforbruk offshore	234	2486	34565870	99,5371	C	60,62		C
Materialforbruk offshore	235	2481,5	34568351,5	99,5443	C	60,88		C
H502A ACO HYGIENE SKUM PH 250KG	236	2470,63	34570822,2	99,5514	C	61,14		C
Intergard 276 white	237	2470,4	34573292,6	99,5585	C	61,4		C
20211 KERBACK RD1202T	238	2455,2	34575747,8	99,5656	C	61,66		C
N8 4" WN 300# RF Sch 80S	239	2438,4	34578186,2	99,5726	C	61,92		B
N28 4" WN 300# RF Sch 80S	240	2438,4	34580624,6	99,5796	C	62,18		B
N9 4" WN 300# RF Sch 80S	241	2438,4	34583063	99,5866	C	62,44		B
N10 4" WN 300# RF Sch 80S	242	2438,4	34585501,4	99,5937	C	62,69		B
N31 4" WN 300# RF Sch 80S	243	2438,4	34587939,8	99,6007	C	62,95		B
Spare 2" WN 300# RF Sch XXS	244	2413,94	34590353,7	99,6076	C	63,21		B
17 tonn,s H-sjakkel	245	2364	34592717,7	99,6144	C	63,47		C
Ritnr: Mibas NO.630-1120 incl material 3mm 316L	246	2340	34595057,7	99,6212	C	63,73		C
Materialforbruk offshore	247	2265,5	34597323,2	99,6277	C	63,99		C
Ritnr: Mibas NO.630-2715 incl material 5mm 316L	248	2256	34599579,2	99,6342	C	64,25		C
Materialforbruk offshore	249	2242,5	34601821,7	99,6407	C	64,51		C
Materialforbruk offshore	250	2197	34604018,7	99,647	C	64,77		B
Interzink 52 grey	251	2186	34606204,7	99,6533	C	65,03		C
charpytesting av AA2150 temp -55	252	2185	34608389,7	99,6596	C	65,28		C
DMC-D30A FREMKALLER 400ML	253	2178	34610567,7	99,6658	C	65,54		C
3" Elbow LR sch 10S	254	2175,2	34612742,9	99,6721	C	65,8		B
Navneplater etter vedlegg	255	2138,4	34614881,3	99,6783	C	66,06		C
Materialforbruk offshore	256	2072,04	34616953,3	99,6842	C	66,32		C
******* BYCO RP20LT LAV TEMP	257	2034	34618987,3	99,6901	C	66,58		C
DMC-C10 RENSEVÆSKE 400ML	258	2034	34621021,3	99,6959	C	66,84		C
Materialforbruk offshore	259	2015	34623036,3	99,7017	C	67,1		C
Materialforbruk offshore	260	2007,5	34625043,8	99,7075	C	67,36		C
TESTING AV RØRBITER VED -60GR	261	1970	34627013,8	99,7132	C	67,62		C
Materialforbruk offshore	262	1964,8	34628978,6	99,7189	C	67,88		C
136853 gjengestenger M24x1000	263	1962,5	34630941,1	99,7245	C	68,13		C
Ritnr: Mibas NO.630-2242 incl material 2mm 316L	264	1928	34632869,1	99,7301	C	68,39		C
Materialforbruk offshore	265	1904,63	34634773,8	99,7355	C	68,65		C
Ritnr: Mibas NO.630-2246 incl material 3mm 316L	266	1820	34636593,8	99,7408	C	68,91		C
N20-N21-N22 2" WN 300# RF Sch 160	267	1810,45	34638404,2	99,746	C	69,17		B
12" 300# BL FLANGE RF A105N	268	1790	34640194,2	99,7511	C	69,43		B
AVESTA CLASSIC PICKLING SPRAY 204	269	1663,2	34641857,4	99,7559	C	69,69		C

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Materialforbruk offshore	270	1663,2	34643520,6	99,7607	C	69,95		C
FRAKT + EMBALLERING	271	1533,4	34645054	99,7651	C	70,21		C
Materialforbruk offshore	272	1500	34646554	99,7695	C	70,47		C
Materialforbruk offshore	273	1500	34648054	99,7738	C	70,73		C
Materialforbruk offshore	274	1500	34649554	99,7781	C	70,98		C
Materialforbruk offshore	275	1500	34651054	99,7824	C	71,24		C
Materialforbruk offshore	276	1500	34652554	99,7867	C	71,5		C
Materialforbruk offshore	277	1500	34654054	99,7911	C	71,76		C
Materialforbruk offshore	278	1424	34655478	99,7952	C	72,02		C
Materialforbruk offshore	279	1392	34656870	99,7992	C	72,28		C
Materialforbruk offshore	280	1392	34658262	99,8032	C	72,54		C
Interzone 3507 light grey	281	1314,6	34659576,6	99,807	C	72,8		C
Thinner GTA220	282	1210	34660786,6	99,8104	C	73,06		C
Thinner GTA822	283	1210	34661996,6	99,8139	C	73,32		C
N17A-N17B 2" WN 300# RF Sch XXS	284	1206,97	34663203,6	99,8174	C	73,58		B
N19A-N19B 2" WN 300# RF Sch XXS	285	1206,97	34664410,6	99,8209	C	73,83		B
N20A-N20B 2" WN 300# RF Sch XXS	286	1206,97	34665617,5	99,8244	C	74,09		B
N21A-N21B 2" WN 300# RF Sch XXS	287	1206,97	34666824,5	99,8278	C	74,35		B
N22A-N22B 2" WN 300# RF Sch XXS	288	1206,97	34668031,5	99,8313	C	74,61		B
N29-N30 2" WN 300# RF Sch 160	289	1206,97	34669238,4	99,8348	C	74,87		B
N17-N18 2" WN 300# RF Sch 160	290	1206,97	34670445,4	99,8383	C	75,13		B
N28A-N29A 2" WN 300# RF Sch XXS	291	1206,97	34671652,4	99,8417	C	75,39		B
N28B-N29B 2" WN 300# RF Sch XXS	292	1206,97	34672859,3	99,8452	C	75,65		B
N30A-N30B 2" WN 300# RF Sch XXS	293	1206,97	34674066,3	99,8487	C	75,91		B
Materialforbruk offshore	294	1200	34675266,3	99,8521	C	76,17		C
Materialforbruk offshore	295	1200	34676466,3	99,8556	C	76,42		C
Materialforbruk offshore	296	1200	34677666,3	99,8591	C	76,68		C
Materialforbruk offshore	297	1200	34678866,3	99,8625	C	76,94		C
FRAKT	298	1190,4	34680056,7	99,8659	C	77,2		C
Materialforbruk offshore	299	1184	34681240,7	99,8693	C	77,46		C
SIKAFLEX 521 UV HVIT 300ML	300	1181,16	34682421,9	99,8727	C	77,72		C
Navneplate ihht vedlagt DWG 316materiale	301	1069	34683490,9	99,8758	C	77,98		C
Frakt	302	1062	34684552,9	99,8789	C	78,24		C
5041022 BYCO C5 RENSEVÆSKE	303	1017	34685569,9	99,8818	C	78,5		C
FRAKT	304	1003	34686572,9	99,8847	C	78,76		C
30" 300# bluegard	305	1000	34687572,9	99,8876	C	79,02		C
SANDVIK R22.8.3.L 2.00X1000 TIG	306	975	34688547,9	99,8904	C	79,27		C
FRAKT	307	926	34689473,9	99,8931	C	79,53		C
Materialforbruk offshore	308	905	34690378,9	99,8957	C	79,79		C
Materialforbruk offshore	309	905	34691283,9	99,8983	C	80,05		C
Materialforbruk offshore	310	905	34692188,9	99,9009	C	80,31		C
Materialforbruk offshore	311	905	34693093,9	99,9035	C	80,57		C
Materialforbruk offshore	312	905	34693998,9	99,9061	C	80,83		C
7151320100 P51 3,2MM	313	888	34694886,9	99,9086	C	81,09		C
Materialforbruk offshore	314	875,93	34695762,8	99,9112	C	81,35		C
8"x300# RF Camprofile 316+FG 4,3mm ASME B16.20	315	815,4	34696578,2	99,9135	C	81,61		C
Materialforbruk offshore	316	814	34697392,2	99,9159	C	81,87		C
U-BOLT M12 316L FOR 1 1/2" RØR	317	780	34698172,2	99,9181	C	82,12		C
Materialforbruk offshore	318	760	34698932,2	99,9203	C	82,38		C
Materialforbruk offshore	319	750	34699682,2	99,9225	C	82,64		C
Materialforbruk offshore	320	737	34700419,2	99,9246	C	82,9		C
C830D ARROW ANTI-SPATTER WATER BASED 500ML	321	704	34701123,2	99,9266	C	83,16		C
00403-20-120 STUD BOLT A320 3/4X120	322	701,23	34701824,4	99,9286	C	83,42		C
324566 3/4 NPT GJENNOMG TAPP (LEVERT)	323	699	34702523,4	99,9306	C	83,68		C
SANDVIK 24.13.L 2,0MM TIG	324	690	34703213,4	99,9326	C	83,94		C
Hengelås Trioving 5652r/25A2	325	673,45	34703886,9	99,9346	C	84,2		C
Materialforbruk offshore	326	650	34704536,9	99,9364	C	84,46		C
eske til målband	327	640	34705176,9	99,9383	C	84,72		C
Tynner GTA220	328	605	34705781,9	99,94	C	84,97		C
Thinner GTA007	329	605	34706386,9	99,9418	C	85,23		C
N23 2" WN 300# RF Sch XXS	330	603,48	34706990,4	99,9435	C	85,49		B
N24 2" WN 300# RF Sch XXS	331	603,48	34707593,8	99,9452	C	85,75		B
N25 2" WN 300# RF Sch XXS	332	603,48	34708197,3	99,947	C	86,01		B
N26 2" WN 300# RF Sch XXS	333	603,48	34708800,8	99,9487	C	86,27		B
N19 2" WN 300# RF Sch 160	334	603,48	34709404,3	99,9504	C	86,53		B
N23 2" WN 300# RF Sch 160	335	603,48	34710007,8	99,9522	C	86,79		B
517302 kjetting rf 3mm langl aisi 316	336	577,2	34710585	99,9538	C	87,05		C
36109-12-08 rett skjøt npt3/4-1/2 utv/innv bushing	337	576	34711161	99,9555	C	87,31		C
M6X16 A4 316L UMBRACOSKRU (BLIR HENTET)	338	564	34711725	99,9571	C	87,56		C
Materialforbruk offshore	339	560	34712285	99,9587	C	87,82		C
215285 6x130 tx skruer	340	535,4	34712820,4	99,9603	C	88,08		C
Materialforbruk offshore	341	529	34713349,4	99,9618	C	88,34		C
leg tillegg	342	509,4	34713858,8	99,9633	C	88,6		C
5021050 AGFA G135 MASKINFREMKALLER	343	504	34714362,8	99,9647	C	88,86		C
Materialforbruk offshore	344	502	34714864,8	99,9662	C	89,12		C
Materialforbruk offshore	345	501	34715365,8	99,9676	C	89,38		C
arbeid	346	500,28	34715866	99,9691	C	89,64		C

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Materialforbruk offshore	347	490	34716356	99,9705	C	89,9		C
FRAKT OVER NATT	348	474	34716830	99,9718	C	90,16		C
Materialforbruk offshore	349	467	34717297	99,9732	C	90,41		C
Materialforbruk offshore	350	448,2	34717745,2	99,9745	C	90,67		C
over natta pakke	351	446	34718191,2	99,9758	C	90,93		C
1402-22-150 Studbolt A320 L7/A194 Gr 7 HDG	352	442,32	34718633,6	99,977	C	91,19		C
Avgifter	353	436	34719069,6	99,9783	C	91,45		C
36109-08-04 rett skjøt npt1/2-1/4 utv/innv bushing	354	417,6	34719487,2	99,9795	C	91,71		C
frakt	355	382	34719869,2	99,9806	C	91,97		C
frakt	356	360	34720229,2	99,9816	C	92,23		C
Materialforbruk offshore	357	350	34720579,2	99,9826	C	92,49		C
Materialforbruk offshore	358	336	34720915,2	99,9836	C	92,75		C
2"300# BLUEGARD	359	324,8	34721240	99,9845	C	93,01		C
fjøler 1"x6"	360	324,52	34721564,5	99,9855	C	93,26		C
paller	361	300	34721864,5	99,9863	C	93,52		C
00403-98-020 NUTS 3/4 A194	362	288,59	34722153,1	99,9872	C	93,78		C
Materialforbruk offshore	363	284	34722437,1	99,988	C	94,04		C
Frakt	364	280	34722717,1	99,9888	C	94,3		C
Materialforbruk offshore	365	272,5	34722989,6	99,9896	C	94,56		C
5021055 AGFA G335 FIX TIL MASKIN	366	237,75	34723227,3	99,9903	C	94,82		C
SS-10MO-1-4 MALE CONNECTOR 10MMX1/4NPT 316	367	233,34	34723460,7	99,9909	C	95,08		C
Materialforbruk offshore	368	223,6	34723684,3	99,9916	C	95,34		C
PORTO	369	222,26	34723906,5	99,9922	C	95,6		C
516350 sjakkel rf m5	370	210	34724116,5	99,9928	C	95,85		C
Materialforbruk offshore	371	200	34724316,5	99,9934	C	96,11		C
FRAKT OVER NATT	372	200	34724516,5	99,994	C	96,37		C
Materialforbruk offshore	373	191	34724707,5	99,9945	C	96,63		C
174557 m30 mutter	374	179,9	34724887,4	99,995	C	96,89		C
Sertifikater	375	175,04	34725062,5	99,9955	C	97,15		C
Sertifikater	376	175	34725237,5	99,996	C	97,41		C
196014 m30 skiver	377	170,5	34725408	99,9965	C	97,67		C
SS-6MO-1-4 MALE CONNECTOR 6MMX1/4NPT 316	378	170	34725578	99,997	C	97,93		C
FRAKT	379	150	34725728	99,9975	C	98,19		C
Materialforbruk offshore	380	150	34725878	99,9979	C	98,45		C
Materialforbruk offshore	381	150	34726028	99,9983	C	98,7		C
2"150# BLUEGARD	382	147	34726175	99,9987	C	98,96		C
Materialforbruk offshore	383	144,8	34726319,8	99,9992	C	99,22		C
Materialforbruk offshore	384	125,4	34726445,2	99,9995	C	99,48		C
Materialforbruk offshore	385	93,86	34726539	99,9998	C	99,74		C
Materialforbruk offshore	386	72,71	34726611,7	100	C	100	80,57	C