Master's Thesis

Erkki Kekkonen 2014

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Industrial Engineering and management
Business Performance Management

Master's Thesis

Designing of Balanced Performance Measurement System to Purchasing Process

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Työn nimi: Tasapainotetun suorituskykymittariston suunnittelu ostoprosessiin

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Suorituskyvyn mittaaminen tuottaa tietoa liiketoimintaprosessin toiminnasta, jonka perusteella yrityksen suorituskykyä voidaan parantaa. Tasapainotetulla mittaristolla voidaan ottaa huomioon monen osatekijän näkökulmat suorituskyvyn mittauksessa ja johtaa liiketoimintaa yrityksen strategian mukaisesti. Yrityksen kustannuksista merkittävä osuus tulee ostoprosessin tuotoksena, jonka vuoksi ostoprosessin suorituskyvyn mittaaminen on tärkeää.

Tutkimuksessa perehdytään tasapainotetun suorituskykymittauksen teoriaan ja suunnitellaan ostoprosessin suorituskykymittariston viitekehys. Suunniteltu ostoprosessin suorituskykymittaristo testataan case-yrityksessä huomioiden yrityksen tietojärjestelmien ja muiden tekijöiden vaikutus. Testattua tasapainotettua ostoprosessin suorituskykymittaristoa parannetaan testijakson aikana ja huomiota kiinnitetään tavoitteiden määritykseen ja mittarien skaalaukseen. Testauksessa todetut kehitystarpeet erityisesti mittarien skaalauksessa toteutetaan ja testin tulokset arvioidaan. Lopuksi tutkimuksen tulokset arvioidaan, johtopäätökset ja jatkotutkimusaiheet esitetään.

ABSTRACT

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Subject: Designing of Balanced Performance Measurement System to Purchasing Process

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The performance measurement produces information about the operation of the business process. On the basis of this information performance of the company can be followed and improved. Balanced performance measurement system can monitor performance of several perspectives and business processes can be led according to company strategy. Major part of the costs of a company is originated from purchased goods or services are an output of the buying process emphasising the importance of a reliable performance measurement of purchasing process.

In the study, theory of balanced performance measurement is orientated and framework of purchasing process performance measurement system is designed. The designed balanced performance measurement system of purchasing process is tested in case company paying attention to the available data and to other environmental enablers. The balanced purchasing performance measurement system is tested and improved during the test period and attention is paid to the definition and scaling of objectives. Found development initiatives are carried out especially in the scaling of indicators. Finally results of the study are evaluated, conclusions and additional research areas proposed.

Foreword

This Master's Thesis is created after inspirational daily work in Procurement organization between 2011 and 2014. Performance measurement has been interesting part of my daily work during my whole career and studying alongside work has been very gratifying.

I would like to thank very much Professor Hannu Rantanen for patience and support during this studying and M.Sc. Siv Schüller for excellent guidance to focus on essential issues in this study and also all the support in my daily work. I would also like to thank CPO Martti Ronkainen for this opportunity and all the support in my daily work.

Finally, I would like to thank my sons Leo and Aaro for patience and support with my studying. As discussed few times with my sons, it is much easier in many respects to study younger, but perhaps not so appealing as studying older.

Porvoo 30.11.2014

Table of Contents

1 INTRODUCTION

1.1 Background of the research

Performance measurement is an important area in managing processes efficiently. Also with reliable measurement, processes' performance improvement or degradation can be found and corrective actions established to appropriate area. Generally known wisdom is that "you cannot manage what you cannot measure" and also "what gets measured gets done". Therefore measuring performance is essential part in managing processes and improving performance.

Importance of performance measurement has been increasing last decades together with global competition. Interest of the performance measurement area has been increased especially after the Kaplan and Norton's framework of Balanced Scorecard was published 1990's and since the balanced Scorecard came very popular in enterprises and also in other organizations. It has been estimated in 2002 that 60 % of Fortune 1000 enterprises have a Balanced Scorecard in place. The Hacket Group survey covering 2000 global enterprises expressed that even 96 % of studied companies have planned or already implemented the Balanced Scorecard tool (Niven 2006, p. 2). One of the main reasons for performance measurement success has been seen on the linkage to company's strategy and performance measurement with also non-financial measures (Niven 2006, p. 6).

Performance measurement has already been used for centuries, but integrated and balanced performance managements systems gives better performance than average. In an US study, organizations using performance management was reported even 25 % reduction of overhead costs and increasing of sales and profits compared to other organizations. Performance managing systems gives also intangible results, but might require more effort than gain value. (Martinez 2006, p. 6)

Purchasing process is managing external resources of companies and purchasing is generating and using information concerning these resources. External resources are covering more and more value of the organizations' total costs, thus the importance of purchasing process has been increasing. By increased amount of external resources, better financial results may be achieved by efficiently managing of a purchasing process.

1.2 Purpose and scope of the research

The purpose of this research is to analyse how performance measurement system can be designed and utilized in a purchasing processes covering operational and capital expenditure areas in several purchasing categories.

This research is made to find answers to following questions:

1. How purchasing process performance can be measured with balanced views?
2. What is the most suitable performance measurement system to purchasing process handling various types of goods and services?
3. How performance measurement system can be scaled to present relevant progress and trend?

This research is based on the case study with designing and implementing most suitable purchasing performance measuring system to indirect purchasing organization to global company based in Finland. Also purpose is to define reliable and useful performance measuring system to purchasing process. In the case company, there are several purchasing teams with slightly variable purchasing processes. Purchasing team's performance should be measured in balanced method, through theoretical framework and adapt performance measurement smoothly to existing business environment.

The scope of this research is to find the most suitable performance measurement system for a purchasing process. This study is focusing on the balanced performance measurement systems and defining of most appropriate performance measuring system to a purchasing process. This study is covering purchasing process especially for indirect purchasing, but purchasing process in general to be utilized with a similar kind of purchasing processes.

1.3 Methodology and structure

The study is conducted in a versatile environment by studying the performance measurement in generic process and centralized organization. Business economics research approaches are divided to theoretical and empiric approaches. Theoretical research is studying issues

through methodologies and theories, studies are based often on previous researches. Empirical research is studying and solving real-life problem by gathering new information with defined specific method. Studies have often both theoretical and empirical aspects and therefore clear classification cannot be made between theoretical and empirical approaches. (Uusitalo 1991, p. 61)

Research approaches can be divided to descriptive and normative ones. Descriptive approach is describing the study and problem, whereas normative is instructions creative approach. (Olkkonen 1994, p. 59-78)

Constructive method is a solution oriented normative method and constructive approach in study is a problem solving method in a real-life organizational setting through the construction of a management system (Kasanen et al. 1991, p. 318). According Sillanpää (2010, p.25) constructive approach is defined as follows: "The constructive approach refers to a problem-solving approach producing innovative constructs intended to solve through constructing a model and making a contribution to the theory of science in which it is applied. Constructs tend to create new reality by producing solutions to explicit managerial problems."

Research approaches are categorized in following matrix characterizing descriptive and normative approaches in theoretical and empirical main categories, described in Figure 1 (Kasanen et al. 1991, p. 317). In this matrix different research approaches can be identified and corresponding approach defined and utilized. In this study performance measuring system is defined also to solve managerial problems in the reorganized business process. The performance system definition is requiring an iteration process and therefore constructive approach is selected.

Constructive study has typically the following phases:

1. Defining a relevant and scientifically interesting problem
2. Finding pre-understanding of area to be studied
3. Innovation, construction of solution model or frame work
4. Testing of solution model i.e. proving correctness of constructed model
5. Proofing used theoretical frame work connections and scientific value
6. Clarification of constructed model's coverage

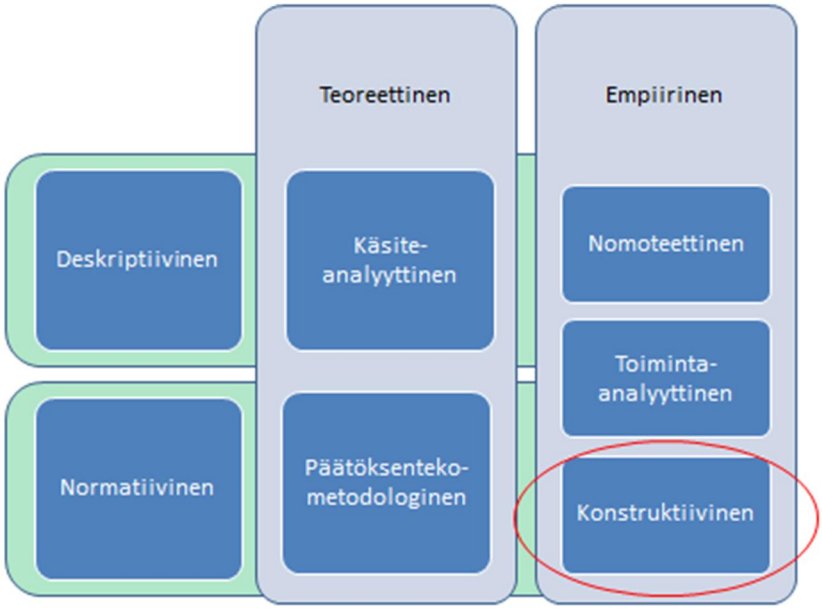


Figure 1: Research approaches in business economics with chosen approach (Kasanen et al. 1991, p.317).

In the constructive approach innovation, creativity and heuristics are empathized as innovation and creativity are generating problem solving and new construction. Heuristic approach can be found in determining the solution step by step and testing of these steps. Proofing the test results in real environment is an essential part of the constructive approach (Olkkonen 1994, p.76; Pekkola 2006, p. 6). Usually there are several variable parameters in a business process, which defining is requiring analysis step by step and reflection by results.

In this study, performance measurement system is designed based on a theoretical framework and adapted to the company's environmental systems and processes enabling performance measurement system usage. Effective performance measurement system is linking strategy and processes together. In the study, theory of performance measurement is united to theoretical framework. This framework is tested in the case unit. The case unit´s strategy and the key targets are guiding also targets of the purchasing process, required actions and also requirements to performance measurement. The existing data systems are enabling the purchasing performance and these data systems are used to provide chosen information to the designed performance system.

This study is constructed in nine chapters and three main sections as presented in Figure 2.

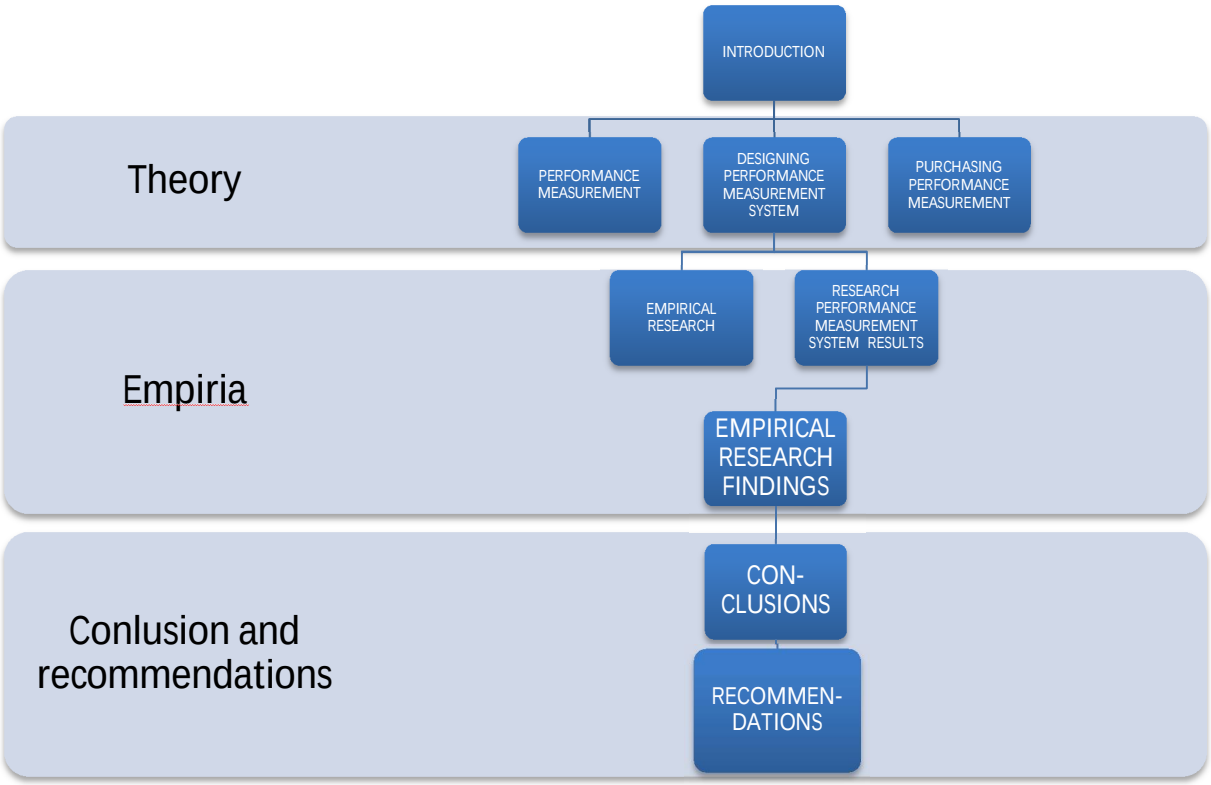


Figure 2: Structure of the study report.

Theory is described in first section including theoretical knowledge of performance measurement in chapters 2 to 4. Section 2 is empirical section covering chapters 5 to 7. In this section performance management system design work is presented and the purchasing performance measurement system defined.

In the third section results are evaluated, conclusions proposed and respective recommendations expressed. This section is covering chapters 8 and 9.

2 PERFORMANCE MEASUREMENT

2.1 Measuring performance

Performance is defined as an ability to provide results with set dimensions relation to set targets. This definition has open parameters for dimensions and set targets. Primary target for enterprises is a profitable operation and yield (Niven 2006, p. 73). On the process view, performance measurement is giving information how well process is producing planned goods or services (Andersen 1999, p. 31).

Common understanding is that you get what you measure and that you cannot manage issues without measures, facts. Performance measurement and management systems are requiring continuous work in updating and using. Despite of good results with performance measurement systems, there are several organizations running well without any performance measuring system. Survey in UK showed that performance measuring systems improved productivity and operational improvements over 50 % of and employee performance on 39 % manufacturing companies. Also employee's participation discussions increased 72 % of manufacturing companies. (Martinez 2006, p. 9)

Performance measuring system is described as a tool which is allocating responsibilities and decision rights, setting targets and rewarding achievements. Performance measuring systems is also a tool for monitoring performance to personnel giving relevant information to personnel and management of the company.

2.2 Performance measurement systems

2.2.1 Balanced Scorecard

Robert Kaplan and David Norton presented the Balanced Scorecard in 1990 and it has been the most popular performance management systems in companies after that. The Balanced Scorecard has been one of the most used or referred business processes measuring system in last 2 decades. The Balanced Scorecard has been developed mainly for implementation of company strategy. Kaplan and Norton (1996, p.9) described the Balanced Scorecard with four major perspectives: Customer perspective, internal business perspective, financial perspective and innovation and learning perspective.

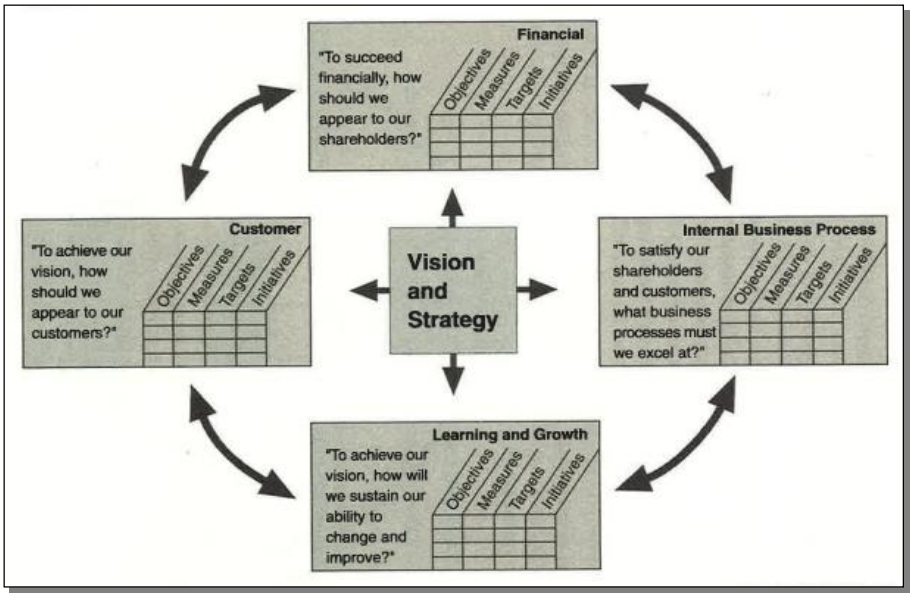


Figure 3: Framework of the Balanced Scorecard, Kaplan (1996, p. 9).

The Balanced Scorecard focuses on performance measurement and compares progress towards company strategy with four performance measurement perspectives as described in Figure 3. According Niven (2206, p.20) important issue is that performance measuring is based on real data reflecting progress of the performance. The Balanced Scorecard (BSC) is an integrated framework of performance measurement, which can be considered to be developed from French Tableau de Bord. The Tableau de Bord integrates strategy, management and operations to set of control parameters reflecting performance from each level to performance of the whole organization. (Chenhall and Langfield-Smith 2007, p.276)

The Balanced Scorecard was created in early 20th century to connect enterprise's unique vision and mission into set of objectives. Key success factors and key performance indicators shall be defined in order to reach these objectives and to monitor progress. The Balanced Scorecard is a framework to facilitate organization's strategy into action. It is more than list of measures of four perspectives. "Kaplan and Norton defined the BSC as a multidimensional framework for describing, implementing and managing strategy at all levels of an enterprise by linking, through a logical structure, objectives, initiatives and measures to an organization's strategy" (Abran 2003, p. 340).

The Balanced Scorecard is determined in the following: “The Balanced Scorecard is carefully selected set of quantifiable measures derived from organization’s strategy”. Niven (2006, p. 13) writes that the Balanced Scorecard is seen as communication tool, measurement system and strategic management system described. In addition Neely (2005, p. 41) noted that “balanced scorecard is one (scorecard) that contains not only an appropriate mix of both financial and non-financial measures, but also a balance of internal and external plus input and output measures.”

In the following Kaplan and Norton's the Balanced Scorecard is described starting from mission, vision and strategy of a company and its linkage to four performance measurement perspectives.

Mission, values, vision and strategy

Mission expresses the core purpose of the organization. Most companies’ main target is to create profit and economical welfare to shareholders. Mission expresses the reason why company and organization exists above the normal profit making. Mission is defined to express more than reachable goal and targets; it is described to be the compass to guide organization. “In today’s hectic business world, you need a star to steer by and your mission should provide just that” (Niven 2006, p. 73).

Mission statement is used in discussing company’s mission in the organisation. Mission is defined in a form, which will inspire to change, mission will last for a long time and mission is easy to understand and communicate. In a mission statement, it is used to express mission to employees and stakeholders (Niven 2006, p. 73). The mission statement is describing targets beyond day to day work, but it will same time define major issues like key target markets and main products (Kaplan and Norton 1996, p. 24). Strategy is described as doing right things; it is a plan which target is to give the enterprise competitive advantage through differentiation of rivals (Harvard 2005, p. xiv). Strategy is defining in a company what to do and how, and also what not to do to gain competitive advantage. With strategy and with set of chosen activities, companies differentiate from competitors on the market. Niven (2006, p. 90) notifies that

strategy is also defining what markets and goods a company is servicing and more importantly, strategy is also telling what the company is not going to do.

The Balanced Scorecard's main focus is transforming mission, strategy and company values into measurable objectives and actions enabling company strategy to be implemented. The Balanced Scorecard is a framework to communicate mission and strategy including drivers of company's future success (Kaplan and Norton1996, p. 25). The Balanced Scorecard's main target is to clarify vision and strategy and to create framework for executing strategy in the organization. With measurable actions which are linked to company strategy, execution and progress can be monitored.

Financial -perspective

Financial perspective is the most common dimension expressing total performance of all function of organisation. "Balanced Scorecard can make the financial objectives explicit, and customize financial objectives to business units in different stages in their growth and life cycle" (Kaplan and Norton 1996, p. 61). The Balanced Scorecard has the basic idea that all objectives and measures in other perspectives should be linked to one or more objectives. In the financial perspective, long time target for the business, is to generate financial returns to investors. All strategies, programs and actions should enable the business unit to achieve its financial objectives. (Kaplan and Norton 1996, p. 62)

According to Kaplan and Norton (1996, p. 62) financial perspective can be divided in three different themes: first is revenue growth and mix, second theme is cost reduction or productive improvement and third theme is asset utilization or investment strategy. Revenue growth and mix is acting on products' and customers' areas to gain better income by selecting most suitable product and market mix. Cost reduction is actions targeting unit cost reduction by improving product, processes and supply chain. Asset utilization is targeting to improve financial results by minimizing working capital and optimizing fixed assets' utilization.

Financial dimension is linking all other perspectives of the Balanced Scorecard together. Kaplan and Norton (1996, p. 62) expressed that “The Scorecard should tell the story of the strategy, starting with the long run financial objectives, linking these to the sequence of actions that must be taken with financial processes, customers, internal processes, and finally employees and systems to deliver the desired long term economic performance“.

Customer -perspective

In the customer perspective, companies and organizations have identified, in which markets and customer segments they have chosen to compete. Companies are getting their most important part of turn over from these segments and important is that these goods or services have to be delivered in a profitable way. As companies have differentiated to beat rivals on the market, customer perspective have to secure good progress in the near future and also after few years. Customer perspective is in a way the core of the balanced performance metrics. If it is not succeeded in creating suitable goods or services, which are satisfying customer needs in shorter and longer time frame, income will not be gained loosing vitality in the performance and business will fade away (Olve et al 1998, p. 59).

Internal processes - perspective

Internal processes are delivering results for customer and financial perspective. One of the key issues is to define the most important processes and measure them. Usually the Balanced Scorecard's internal processes are defined after the financial and customer perspectives targets are set. After targets, the most valuable processes can be judged and measurement established. Kaplan and Norton (1996, p. 92) state, that it is essential to define complete chain of internal processes creating value to customers. These processes have to be defined starting from innovation process to the after sales services covering all main processes which are adding value to the customers from company’s products or services. Also these internal processes have to be defined including new products and services offering.

One of the main problems with use of the Balanced Scorecard is that the Balanced Scorecard (BSC) does not have a causal link between goals and drivers. Also there is no quantitative

indication how much relative or absolute each measure of the BSC contributes. The BSC has described as a dashboard of a company, but each perspective reflects more how well the company's strategy has been implemented and each measure has to be understood in its own circumstances.

There is a major difference between traditional business performance measurement and The Balanced Scorecard with measuring internal processes. Performance has been traditionally measured by financial measures and monthly variance of departmental operations. According Kaplan and Norton (1996, p.93) trend has been to measure internal business processes which typically are: order fulfilment, procurement and production planning. These chosen internal processes are typically measured by cost, quality, throughput and time measures.

Learning and Growth- perspective

The learning and growth is the fourth original perspective of Kaplan and Norton's the Balanced Scorecard framework. Learning and growth - perspective is the foundation of the financial, customer and internal business process- perspectives. As the other perspectives are describing how the company strategy has achieved on the view of business processes and external view, the learning and growth – perspective is focusing on how organization can achieve these requirements and how to establish capabilities for future needs. (Kaplan and Norton 1996, p.126)

Learning and Growth-perspective is enabler for the three other perspectives and therefore effort should be used to determine suitable measures and actions to improve performance of the learning and growth perspective. This perspective is essential to close the gap between existing and aimed skills of the company. Within these skills are included the current organizational infrastructure of employee skills, information systems and environment required to maintain success. The Learning and growth-perspective can be seen according Niven (2006, p.16) "as the root of the tree that will ultimately lead through the trunk of internal processes to the branches of customer results and finally to the leaves of Financial returns."

2.2.2 Performance pyramid

The performance pyramid is a performance measurement system created by Lynch and Cross (1995, p. 65-66) to incorporate strategy and functions of the company. Strategy and functions are linked together by flowing customer requirements from top to down, respective performance measures are designed from down to top as presented in Figure 4.

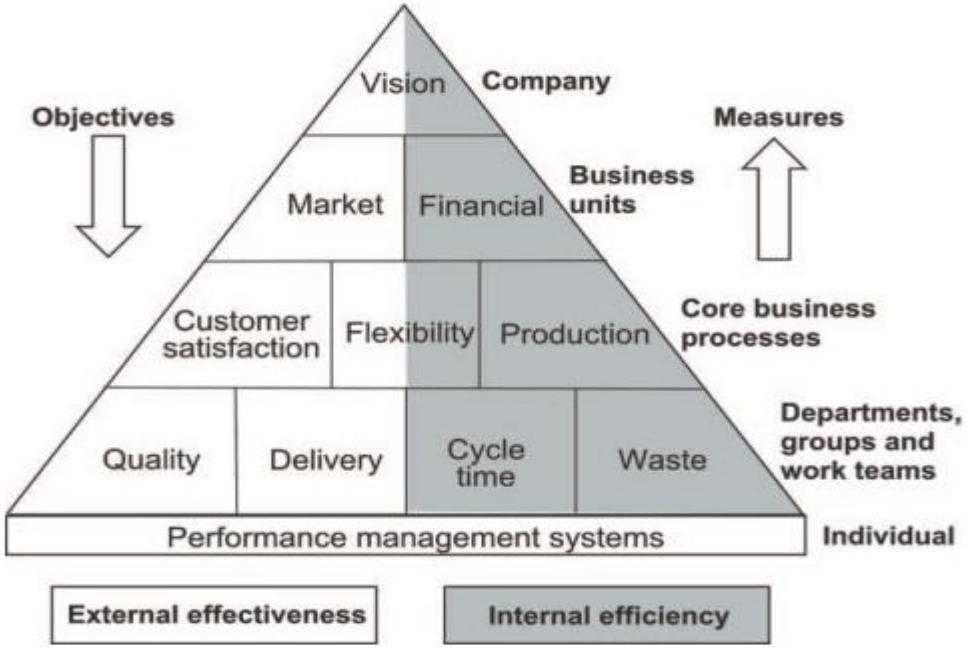


Figure 4: Performance pyramid system (Lynch and Cross 1995, p. 65).

The performance pyramid has four target levels including internal and external performance efficiency. All the four levels have their own performance metrics for these views. Performance pyramid designing is based on the company vision, which will be transformed marketing and cost management targets to business units. Vision and targets will be concluded to performance measures for both market and financial areas. In the performance pyramid company is divided to five levels from individual, department and team level, core business processes and business unit level concluding to the company level. Performance measures of each level are presenting how well each level is attaining targeted performance and appropriate actions may be implemented to reach targets (Lynch and Cross 1995, p. 66).

Rantanen and Holtari (1999, p.48) is describing that company's performance can be measured with performance pyramid. The results of marketing and financial performance and progress of the company business actions according the vision can be monitored and corrective actions assigned. Marketing and financial level targets can be achieved by fulfilling process-level targets. Process level metrics are customer satisfaction, flexibility and productivity. The unit level performance can be measured with defined process level measures. Process level targets are reachable if department or team level metrics for quality, delivery performance, flexibility and waste are reached.

2.2.3 Performance prism

The performance prism is a holistic performance measurement and management framework, which was improved framework on the basis of the Balanced Scorecard, but it is noticing impact of all stakeholders, not only shareholders as presented in the Figure 5 (Neely et al. 2005, p. 43).

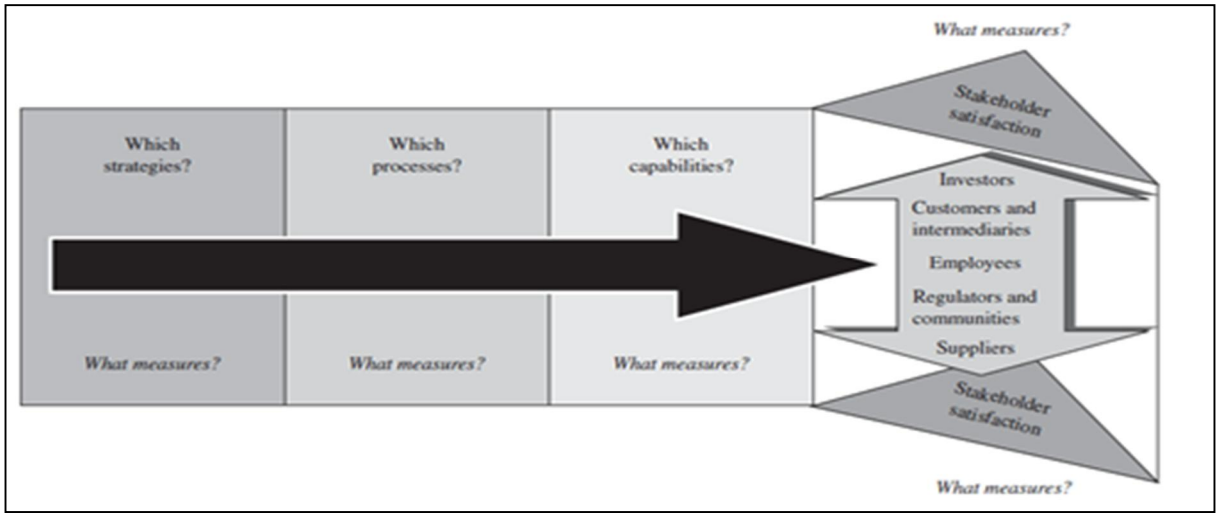


Figure 5: Illustration of Performance Prism (Neely et al. 2005, p. 43).

The performance prism is a multidimensional performance measuring system focusing on organizational performance. According Gomes et al. (2006, p. 326) the performance prism is measuring organization performance with several views, but instead of the Balanced

Scorecard, which is concentrating on the stakeholder satisfaction; the performance prism is concentrating to organizational performance.

The performance prism has three fundamental premises: Organization has to focus on more than one or two stakeholders to survive longer time. Strategies, processes and capabilities have to be in line and to create real value to all of its stakeholders. Organizations and stakeholders have to understand that all the relations are reciprocal; every process gets something and gives something to each of its stakeholders. The performance prism is based on three perspectives: Strategies, processes and capabilities. These perspectives are reflecting organization's performance via customer requirements, internal organization, suppliers and society. The organization is performing according to strategies, processes and capabilities creating stakeholder satisfaction. If compared the Kaplan and Norton's the Balanced Scorecard framework and the performance prism, the major difference is that the Performance prism is taking account of the personnel and the stakeholders, not only the shareholders (Neely et al. 2005, p. 42).

The performance prism is a second generation's holistic management framework having more focus on several stakeholders and their independent needs together with organization’s capabilities. This framework consists of five interrelated perspectives: the first perspective is the stakeholder satisfaction, which is answering to questions: who are our stakeholders and what they want from us? The second issue is the stakeholder contribution, which is answering questions: what do we need from stakeholders and what we will give them back? The third perspective is the strategies: what strategies are needed to satisfy stakeholders and our needs, what are the requirements for the future? Processes are the fourth perspective: what processes are needed to execute our strategies? And the fifth perspective is capabilities; what capabilities are required to run our processes?

Neely et al. (2005, p. 42) highlight that one main principle of the performance prism is that often organizations do not have well defined and updated strategy, which execution can be measured with performance management system like Kaplan and Norton's the Balanced Scorecard. Instead, there are several small companies running well without any written

strategy and performance metrics. These companies have working processes and these processes are taking something and giving back something to all multiple stakeholders. Those stakeholders are investors e.g. shareholders and banks, regulators, communities, personnel, suppliers and customers.

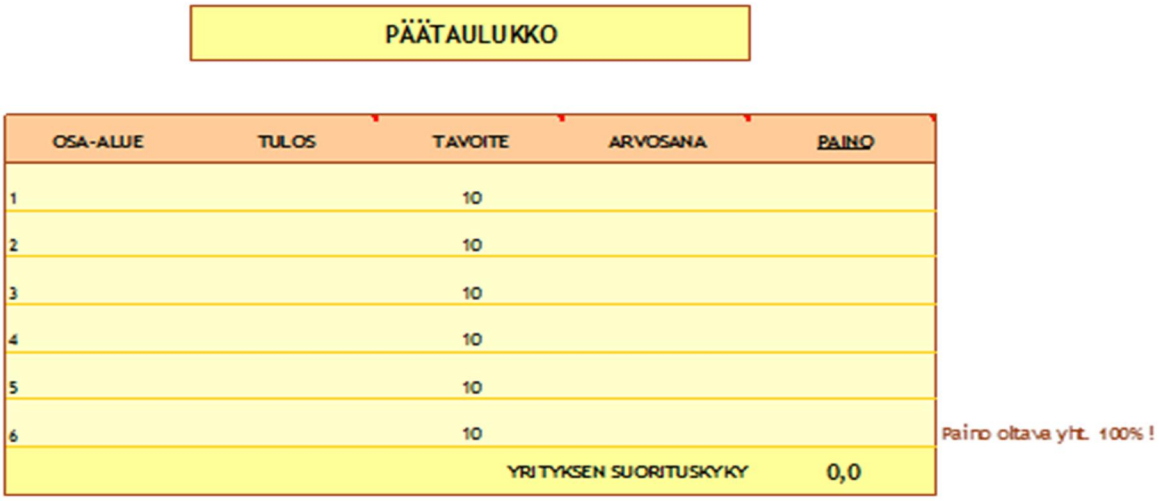
Organizations have different stakeholders with different value. Organization's strategy should describe which stakeholders are important and why. An important question is: Who are the key stakeholders for this organization? What are stakeholders' needs? Each stakeholder has their wants and needs. Stakeholders are important to organization, because they are giving something reciprocally. What are valuable things from our organization toward our supplier? What are important issues to our community? If an organization is making loss of every deal with one stakeholder, future activities will not last long - even if delivery performance and satisfaction indexes show excellent values.

2.2.4 SAKE - application to design performance measurement system

The SAKE is an application tool to create and implement performance measurement system into small and mid-size companies. Easy implementation of balanced performance measuring system to SME- companies has been the key driver for this application. Therefore performance measurement system has several variable parameters for adapting performance measurement system to each company and relevant processes.

The SAKE performance measuring framework is defined in the Microsoft Excel as a macro application. Easy design and implementation of SAKE framework in all kind of companies are enabled with and hand-on implementation and user instructions, which are available in internet. SAKE framework can be adapted to several kinds of processes, each views importance may be priorized with weights as well as each metrics may be priorized with weights ensuring implementation of most suitable measuring system to a company. The SAKE Main table in Figure 6 is presenting the main performance measures which can be

selected and weighted with parameters.



PÄÄTAULUKKO

OSA-ALUE	TULOS	TAVOITE	ARVOSANA	PAINO
1		10		
2		10		
3		10		
4		10		
5		10		
6		10		
			YRITYKSEN SUORITUSKYKY	0,0

Paino oltava yht. 100% !

Figure 6: SAKE Main table.

The SAKE performance measurement model is based on multidimensional measurement principle. This application is available free of charge from website and user interface of measurement system is easy to adapt to several type of different business areas.

The SAKE performance measurement system has maximum 6 performance perspectives and each perspective has 6 performance metrics. Each perspective has a parameter to value its priority with weights in relations to other perspectives. The performance metrics has an independent scale; the scale may be in ascending or descending priority. Performance measurement system has an archive of previous measurements enabling trend presentation of progress of main performance views. Each of the 6 available performance view has an own performance measure sheet consisting of 6 available metrics with independent target and priority parameters as presented in Figure 7.

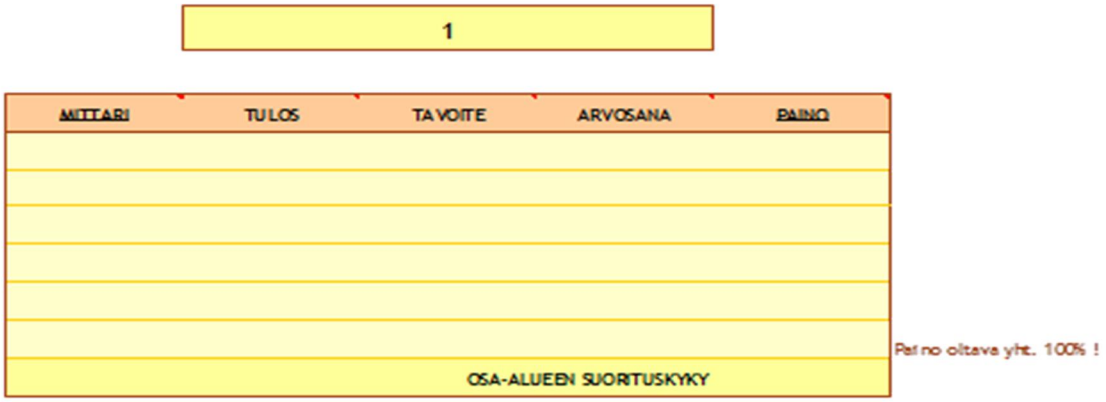


Figure 7: Performance view sheet with 6 independent measures.

The Sake performance measuring system instructions are defining metrics and helping with implementation of the performance measuring system. Instructions are available in the pdf-format and the support is also provided if needed. Sample metrics are provided with comprehensive metrics data calculation or valuing models.

Designing of the SAKE performance measuring system is divided in 4 main sections: Starting of the planning process will be followed with defining a basis of the performance measurement system. The third phase is creation of the metrics and finalizing with the implementation of metrics - phase. The planning phase is including steps of initiation, defining main use of the performance measurement, information sharing and engagement. The last step of the first phase is selection of the project team to design performance measurement system. Basis of the performance measuring system is including steps of defining company vision, strategy, main functions or processes, key success factors and targets. The creation of metrics is consisting steps of defining performance measurement perspectives, selection of metrics and setting up responsibilities. The implementation phase is starting with information sharing and engagement and followed with the test use of the performance measurement system. The fourth and the final phase is establishing performance measurement system and starting to use it as a tool for leadership and management. Improving the performance measurement system is closing the fourth phase of the design process. (SAKE- website http://www3.lut.fi/tuta/lahti/sake).

2.2.5 Other models

Performance matrix

Multi-criteria performance or productivity matrix has been used for performance measurement in applications where the designer may choose the importance by him or herself. Multi-criteria performance matrix has been studied by Sink in 1985 and in Finland by Rehnström 1996. Matrix can be designed to several types of organizations, but matrixes are unique restricting company wise benchmarking. (Rantanen and Holtari 1999, p. 49)

Dynamic performance measurement system

Dynamic Performance measurement system (DPMS) has been introduced in 1996 by Erkki K. Laitinen in the publication "Framework for Small business Performance measurement: Towards integrated PM Systems". DPMS has been innovated to small and mid-sized enterprises (SME) with internal and external factors recognized. This model is mainly focusing to analyse competitiveness of internal processes, but also taken into account of external environment. (Rantanen and Holtari 1999, p. 51)

ICT tailored balanced score card – multidimensional BSC framework QES nD

The Balanced Scorecard has been tailored for ICT-field with two major projects mentioned in the study of Abran and Buglione (2003, p. 341). The European software institute wanted to increase the people perspective as the fifth perspective with the Balanced IT Scorecard (BITS). The fifth element consisting of the employee perspective was also proposed in the study of the Balanced Scorecard of Advanced information Services Inc. As a conclusion proposed perspectives are: Financial Perspective, Customer Perspective, Process Perspective, People Perspective and Infrastructure & Innovation Perspective (Abran and Buglione 2003, p.341).

The following perspectives are identified for a Balanced Scorecard suitable to ICT business area. The first perspective is the financial perspective, which is describing how software processes are creating added value to organization. Then the customer perspective describes how delighted customers are about the delivered products. The third perspective is the process perspective describing how well software development processes meet the expectations. Also the people perspective is describing how well employees skills are

meeting requests and how happy people are in their doing. The fifth perspective is focusing on the infrastructure and Innovation, which is describing how well process improvements, technology and organisational infrastructure are enabling the implementation of the sustainable improvement program.

As a conclusion of the study of Abran and Buglione (2003, p. 348) was proposed n-dimensioned BSC QEST nD-model. In this model each perspective is calculated with own weight and QEST nD can be presented in tetrahedron model as presented in Figure 8.

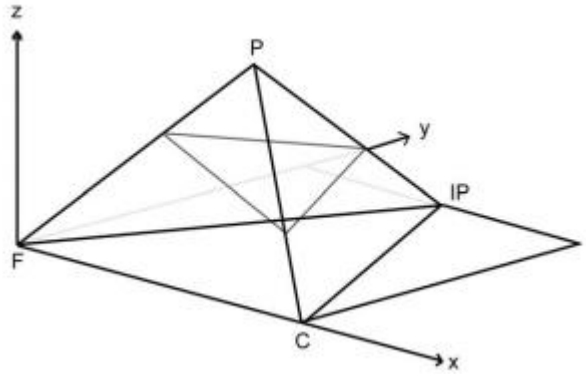


Figure 8: QEST nD -model of BSC framework.

In the QEST nD -model each perspective is monitored with own axis and its result is represented on this axis. The measurement results have their own weight in relation to importance of a perspective measurement. With this type of representing, the complete and holistic result of multidimensional performance measurement can be seen with a single view.

3 DESIGNING PERFORMANCE MEASUREMENT SYSTEM

3.1 Design

Designing and developing the performance measuring system is described with the loop of continuously following steps. According Näslund (1996, p. 146) designing is described with seven steps: Identify areas for measurement, define measurements for each area, collect required data, present related information, analyse gathered information, and final steps are action and learn as presented in Figure 9.

Figure 9: Performance measurement system loop (Näslund 1996, p. 146).

In the performance measurement loop presented by Näslund (1996, p.152), the first step is to identify required areas to be measured. In the very beginning, it is necessary to stop and analyse all required performance areas in order to reach balanced view on processes and performance. The second step is to define measurements of each area related to the first step. Deeper analysis is needed to understand more precisely why and how these measurements will be established. The third step is a data collection including the definition of respective data and to determine responsibilities of producing and analysing appropriate data. Conclusions and corrective actions based on the analysed data will be created in this step. The presenting step is defining the frequency of the performance measurement and the form of the presentation. To analyse performance measurement information is the following step. In this step performance measurement information is analysed and on same time

evaluated how rapid and how deep analysis is required to generate proper corrective actions. The action step is the following analysis step, it is important that corrective actions are analysed and defined before execution, but only executed corrective actions affect. Learning is the last step expressing demand for continuous development and improvement of the performance measurement system. It is said that performance measurement system will never be fully completed and it has to be redesigned time to time like all processes.

Designing implications of Performance measurement of supply chain

In the study of Lohman et al. (2014, p. 269) it is found, that supply chain performance measuring requires balanced set of financial and non/financial measures. These measures have to be derived from the strategy and assigned into specific objectives, which progress can be reflected with relevant measures. Three relevant aspects of the supply chain performance measurement have been revealed. The first aspect is resources, which can be measured by means of expenses and assets. The second aspect is the output with financials, measured with time and quality performance issues. The third aspect is the flexibility by means of volume, delivery, product mixture and an ability to create a new or customise a new product.

Lohman et al (2004, p.270) divided the designing of performance measurement system into three phases. The first phase is the defining of the key objects and relevant measures. The second phase is the implementation including data collection, analysing and defining adequate data capture process for a regular measurement. The third phase is the usage of the performance measuring system in which the organization is reviewing the results and managers are leading corrective actions in order to achieve the set targets. It is important that defined measures are reviewed frequently for monitoring the effect of each measure. All non-working measures have to be replaced with more suitable ones.

In the study of Lohman et al. (2004, p. 284) there were found several improvement areas for the designing of supply chain performance measurement system. The first improvement area, which is also the basis of integrated performance measurement system designing, is to set up a cross-functional alignment forum of managers and users. These managers and cross-

functional forums are working in parallel on the scorecards (e.g. for Operations, Transportation, Warehousing, and Customer Service). These cross-functional forums are sharing open issues in combination with the periodical meetings. Essential is to list all metrics with related attributes and aspects in one document. This is an important part for use and also for the further development of an integrated performance measurement system. The second important area is creation of the standard metric definition template for designing and using performance measurement system. The definition template is including all relevant metric attributes needed to produce or modify metric reading in a consistent way. According to the study of Lohman et al. (2004, p.284), current metric definitions conjoined in a metric dictionary, which served as a basis for development and as a reference for communication with all parties involved.

Clustering is a good basis for development of the performance metrics and to support communication according to study of Lohman et al. (2004, p. 284). The amount of clusters and used definition criteria of clusters have to be adapted to each performance measurement system case by case. It is important to use real data in performance measurement system in order to reach accurate feedback. It was also realized, that the performance measurement system has to have mature basis including the metric dictionary, before suitable software is purchased. The responsible manager for the performance measurement system should be appointed in order to develop the performance measurement system and to align it with the processes. The performance measurement manager should be responsible for usage of the PMS and also accountable for further development of the performance measurement system and implementation of the agreed corrective actions. The most suitable background for the performance measurement manager is the responsible manager of the supply chain or comparable process.

Framework for operational level performance measurement system

Operational level performance measurement framework is defined in the study of Ukko (2009, p.65). It was found that performance measurement was affected by internal and external context factors and system factors. Context factors are e.g. company strategy and

culture and system factors are e.g. design of performance measurement system, implementation and use of performance measurement. Factors affecting operative level performance measurement are the understanding of the connection between individual's targets and organizations aims. Also how performance measurement is connected to incentives is important. Amount of participation in decision- making, clarification of job description and training was highlighted as significant factors, which are affecting effectiveness of performance measurement. In the framework, evaluation and analysis of these factors is the first step prior development actions related to these factors. Measurement of actions and operations including result sharing and discussions is followed with measured performance of employees and operations.

Successful performance measurement is supporting managers in their daily work, but it is not replacing leaders and managers. Autonomy in decision making especially for the personal and team level performance issues is supporting success in the performance measurement implementation according the study of Ukko (2009, p.66). Important issue is to share knowledge of the performance measurement to whole organization. The quality of information and its exactness is important, as well as face to face discussions of the information and the results. If the performance measurement results are used as a basis of rewards, autonomy in daily work is important and also fairness, equitableness and the criteria of rewarding have to be well known. Other issues like leadership and organization's culture have its own impact for the use of the performance measurement system.

Balanced performance measurement in operational department

The study of Grando and Belvedere (2008, p.504) described the designing the balanced performance measurement system to measure operational performance. Performance measurement system was designed with balanced principles delivering a notable advantage according Grando and Belvedere (2008, p. 504): "The key benefits brought about by an up-to-date measurement system rely on its ability to speed up the decision-making process and to boost more intense co-operation among the various units related to operations management (namely, manufacturing, logistics, quality management, procurement,

maintenance) that are generally managed by relatively independent teams. Such coordination requires a deployment of much more complex and detailed objectives than in the most well-known integrated frameworks, which generally call for disaggregating performances for the business processes, but do not address the issue of how to structure the indicators selected for each of them."

In the Grando and Belvedere (2008, p. 504) study, it was revealed that, introduction of the balanced performance system requires stabile processes. In the case company, operations department has been chosen to be the starting point of designing and implementing performance measurement system, but the operational balanced performance measurement system has not been implemented to additional departments because of unstable processes. They found that the most relevant causes of inefficiencies have been removed from the processes of procurement and the manufacturing during the designing and implementation of the performance measurement system. This enabled more stable result and better performance. It was also found that implementing balanced performance measurement system is giving an advantage with identifying proper improvement actions required. Also the use of the performance measurement system is speeding up decision-making process and supporting management in leveraging its process know-how for rapid improvement action plans.

3.2 Design criteria of a performance measurement system

Validity is the utmost important for a performance measurement system. The validity is reflecting how well performance measurement system is measuring a real performance of a company. Accuracy and precision are describing how accurate the performance measuring system is i.e. how accurate measurement values can be repeated. Completeness or collective exhaustiveness is also a very important area in designing of a new performance measurement system. Completeness is describing how wide range of operations in the company is covered and described with the performance measurement system. Uniqueness or mutual exclusiveness is describing that one specific metric is reflecting to one adequate dimension. Also important issue is reliability which is expressing how well measurement data is showing constantly similar values if process is repeated with the same performance results (Rantanen and Holtari 1999, p. 20).

Rantanen and Holtari (1999, p. 23) listed the following additional important design criteria for a performance measurement system. Comprehensibility is meaning that the measuring system should be designed in a way, which is easy to understand for everyone. All the performance measurements should be quantifiable which is meaning that the metrics should be presented in general and common dimensions enabling everyone to quantify the measured values. Controllability is an effective aspect in designing of the performance measurement system. With controllability performance measurement system is guiding people and processes towards targets by monitoring progress and results. Also performance measurement system has to be effective. Effective performance measurement system is designed to earn more value that creation and using of metrics is requiring efforts. Metrics have to be relevant and give valuable information for decision making. Trustworthiness is a key issue meaning that managers and leaders have trust on the performance measurement system's results and results are trusted on basis of decisions. Correct timing is important element in presenting performance metrics' results synchronized with the real process. Also the simplicity in order to make performance measuring system simple to use and easy understand is significant issue. The performance measurement should have a strong connection to the company's strategy. Also suitable balance of different metrics, short and long time span, selection of financial and non-financial metrics together with causation are important issues to be considered during design of a performance measurement system.

It is important to understand why the performance measuring system is designed, what are the key performance elements and who is responsible for using and analysing designed metrics. In the study of Grando and Belvedere (2008, p. 504) uniqueness and expertise in the organization were noted as remarkable issues. But major finding was the risk that managers will have several new indicators and the focus is shattering with multiple targets instead of concentrating to a few important performance metrics and related improvement actions. Essential is to focus on few important performance measurement metrics, which are concluded from the organization's strategy. In addition, the performance measurement system has to be designed to suit to organizational context and has to have adequate measures Neely et al. (1997, p. 1136) notify. As a conclusion important issues to be justified in the designing of the performance measurement system is collected to Table 1.

Characteristic of the good performance measurement system
To be derived from the strategy
Simple to understand
Provide timely and accurate feedback
Base on quantities that can be influenced, or controlled, by the user alone or in co-operation with others
Relate to specific goals and targets
To be relevant
To be part of closed management loop
To be clearly defined
Have a visual impact
Focus on improvement
To be consistent and maintain significance in the future
Provide fast feedback
Have an explicit purpose
To be based on explicitly defined formula and source of data
Employ ratios rather than absolute numbers
Use automatically collected data whenever is available
To be reported in a simple consistent format
Based on trends rather than snapshots
Provide information
To be precise and be exact about what has been measured
To be objective, not based on opinions

Table 1: List of characteristics of the good performance measurement system.

These requirements and characteristics mentioned in Table 1 have been found essential issues in the designing of a good performance measurement system. The listed characteristics should be taken into consideration when a new performance measurement system is designed. The listed characteristics are good basis for designing requirements, but challenging to be fully met. As noted, the performance measurement systems have an organizational and process wise context, but requirements presented in Table 1 should be utilized as much as possible.

3.3 Performance measurement of the Balanced Scorecard

3.3.1 Measuring financial -perspective performance

Kaplan and Norton (1996, p.61) stated that financial performance metrics was included in every Balanced Scorecards they have seen justifying the importance of traditional financial performance metrics. Core financial performance measures are return on investment,

profitability, revenue growth and mix and cost reduction or productivity improvement according to Kaplan and Norton (1996, p. 306). Financial performance measurement is essential for success of a company and financial metrics reflect to targets and success of a company. Proposed metrics are cash flow, growth in sales and operating income. Financial measures are typically lagging measures i.e. measures presenting history. Financial measures are usually well calculated and presented by financial department of the company.

In the Balanced Scorecard, financial objectives and measures should be derived from the strategy and concluded to measures of customers, processes and employee capabilities stated Niven (2006, p. 151). The Balanced Scorecard performance measurement system should have a balanced mixture of leading and lagging performance measures. The performance measurement of financial perspective with financial metrics is leading processes and drive actions towards favourable financial goals. For example financial performance can be measured by amount of hours spent with customers or amount of written proposals. (Niven 2006, p. 145)

3.3.2 Measuring customer -perspective performance

The performance measurement of the customer perspective comprises the most critical issues of the customer management of the company. The customer management can be divided to five subcategories as Niven (2006, p. 155) defined. The first subcategory is the selection of the target customers for the company. The second one is the acquiring of these customers by proactive communication and the third subcategory is the understanding of customer needs. Retaining of existing customers and deepening relationship are the last two subcategories.

The customer needs and wishes have to be transferred to measurable issues. These issues have to be focused beyond baseline metrics as lead time, quality of goods and services, performance satisfaction and the cost of goods. The performance measurement of the customer perspective can be defined in three classes: The first class is the product and service attributes consisting of functionality, quality and price. The second class is the performance of the customer relationship which is consisting of quality of purchasing

experience and personal relationship. The third class is covering image and reputation. The performance measures for the customer perspective can be selected from these classes in order to reach strategic targets. (Kaplan and Norton 1996, p. 85)

3.3.3 Measuring internal business processes -perspective performance

A company has to select internal processes, which will generate the most valuable results for the company in the future. These chosen processes and competences will be measured. In the balanced scorecard internal processes' value chain has been defined. Kaplan and Norton (1996, p. 96-115) state that these operations can be divided in three main sections: innovation process, operations process and post-sale service process. Innovation process is for creating new products and services for customers for future; operations process is creating existing products and services. Post-sale services are executed after original delivery has been made e.g. via training or service operations. These services have been identified as an important process to improve customer satisfaction and also to find improvement needs for delivered goods or services.

Innovation process is identifying new opportunities and linked often to product and service development of the company. "Innovation is frequently compared to a pipeline that is constantly flowing; thus at any given time you may be churning out a number of new product and services, possibly necessitating inclusion the market" (Niven 2006, p. 123). Suitable performance measures for innovation process are listed in Table 2 below.

Performance measures for innovation process
Percentage of sales of new products
Percentage of sales of product or service
New products introduced compared to competitors
Manufacturing process capabilities
Time to develop next generation of products

Table 2: List of performance measures for innovation process.

In Table 2 are listed performance measures for innovation process. These performance measures, which may include profit and cost relation on long term period, can be used to measure profitability of the innovation process. (Kaplan and Norton 1996, p. 100)

Designing of performance measuring system to the internal business process perspective according to Kaplan and Norton's the Balanced Scorecard is described in the following 5 subtitles.

Operation process

The operation process is defined to start from the receipt of customer order and finishing on the delivery of product or service to the customer. There are typically existing goods or services delivered to the existing customers with agreed scope and time. This process is normally repeated several times giving good basis for scientific management techniques for process control. The operations process has been measured for several years, and on that account there is a good background for performance measures. Usually the operational process is quite easy to measure and results of this process are rapidly visible

Typical performance measures for operational process are related to quality, cycle time and cost. These measures are based on operation process in generic, but it has been seen that there is lack of balanced performance measurement approach according to Kaplan and Norton (1996, p.105) remark. Instead these metrics, company could measure flexibility or additional measures which are perhaps more suitable for the process and which are reflecting the added value for customers. Suitable additional measures for a company are measures like accuracy, size, speed, clarity or energy consumptions. Critical product and service performance attributes, which are additional like response time, quality and cost measures, should be evaluated for Balanced Scorecard metrics of internal business process perspective.

Process time measurement

Manufacturing and service companies' lead time is important competing factor. Lead time improvement is also improving manufacturing agility concluding to better customer service. Lead time is defined as time elapsed from placing the order to time when order is completed and goods or services received. Nicholas (1998, p. 75) describes that manufacturing lead

time can be shortened by increasing goods amounts and items in stock. This may conclude to efficient manufacturing process and low unit costs, but it will increase inventory costs and lead time of non-stocked items may be increased a lot. Large inventory is nowadays seen as an “evil” for rapid and agility deliveries, because large inventory may hide process inefficiencies. New innovative products will be launched later, because all stocked items have to be sold out before deliveries of new products. Therefore manufacturing companies have been targeting agile and efficient processes to enable short lead time and customer focused deliveries with competitive costs. Lead time may be measured as time for complete process starting from receiving customer order and ending to time when customer order is delivered. Manufacturing process may be measured with a more narrow scope like measuring time from receiving the order to manufacturing process lasting to completion of the order in the manufacturing process.

Manufacturing process is measured in many companies with a metric of manufacturing cycle effectiveness (MCE). MCE is defined as a ratio of the processing time divided by the throughput time. Throughput time is the sum of processing time, inspection time and all waiting and movement time of product. As manufacturing time is always shorter than throughput time, the ratio is less than 1. In many companies processing time is less than 5 % of throughput time. The process time is describing value added part of manufacturing lead time. All inspection, movement, storage and work in process time are delaying delivery and invoicing, but are instead increasing costs. Thus in ideal manufacturing process MCE value is close to 1. (Kaplan and Norton 1996, p.116-118)

Process quality measurement

Process quality measurements have been used for several decades. Kaplan and Norton (1996, p. 120) have identified suitable performance measures for processes quality performance. Popular quality metric is ratio of defects, which can be presented by part per million defect rates. Also the amount of waste or scrap in the process, the amount of rework or the amount of returns and portion of process under statistical process control are suitable measures for process quality. Service companies have to identify the malfunctions in the internal process which may result bad customer perception.

Bad performing processes are generating more costs than creating value and they are taking more time or cost than customers are willing to pay. Processes' quality performance measurement should indicate too complicated service or delivery, which customers are not willing to accept. Kaplan and Norton (1996, p. 120) have proposed to generate performance metric of an index representing issues which may lead to unhappy customer. This index may be combined from waiting time, information accuracy, easiness of access, fulfilling transactions, financial profit or loss to a customer, communication effectiveness and how customer is treated and valued. This performance metric should give feedback of internal processes status and reflect customer perception.

Process cost measurement

Traditionally costs are calculated by departments and there is seldom calculation covering the whole process. Nowadays with activity based calculation and with the accurate calculation systems, costs can be monitored along each process. Process costs are altering much depending of used manufacturing method, products or process. Calculation should include fixed and volume related costs and all major process steps. For example set up, quality inspection, research and development costs may be remarkable. Process cost can be managed and improved after revealing major cost components. (Kaplan and Norton 1996, p. 117)

Post-sale service

Post-sale service is including inter alia warranty and repair activities, defects and return handling and payment processing. Post-sale service activities are more and more important with complex systems, which usability and minimizing of down time is important to customers. Preventive maintenance, emergency service or life cycle cost and handling services are post-sale services, which are adding value to customers. The post-sale service performance can be measured partly with same measures like operations process is measured. The cycle time, time to reply customer request or speed of failures recovering was mentioned as typical performance measures of post-sale service process by Kaplan and Norton (1995, p. 106). The customer satisfaction is an important aspect to be measured, which performance can be measured e.g. by amount of calls needed to get customer request completed.

3.3.4 Measuring Learning and growth -perspective performance

Learning and growth perspective is the fourth original perspective of the Balanced Scorecard framework as Kaplan and Norton (1996, p.126) described. Learning and growth are the foundation of the financial, customer and internal business process- perspectives. As the other perspectives are describing how the company strategy has achieved on the perspectives of business processes and external dimensions, the learning and growth – perspective is focusing on achieving these requirements in the future. The learning and growth perspective is focusing to establish capabilities for future needs.

In the following the performance measurement of learning and growth -perspective from Kaplan and Norton's the Balanced Scorecard is described in three subtitles.

Employee capabilities

Working environment has changed more complex and there is need for new capabilities in companies and organisations. The company has to improve its performance to maintain relative competitiveness on market, which is requiring new capabilities and continues improvement of the processes. Kaplan and Norton (1996, p. 129) demonstrate that workers are on the front line to customers and internal business processes have to give continuously ideas to improve performance. Kaplan and Norton (1996, p. 129) found that companies have been measuring three core outcome measurements: 1) employee satisfaction, 2) Employee retention and 3) employee productivity. These outcomes are specified for each circumstance with relevant drivers. The employee satisfaction was found and defined to be the driver for employee retention and productivity in this framework.

Employee satisfaction measures

Kaplan and Norton (1996, p. 129) highlights that satisfied employees have the most satisfied customers. The employee satisfaction is understood to be in accordance for productivity, responsiveness to quality and to customer service. It is also noted that the employee satisfaction is influencing to employee retention and to employee productivity. Personal satisfaction measuring areas are listed in Table 3 below.

Personal satisfaction measuring areas
Involvement in decision making
Recognition of doing job well
Access to sufficient information for doing job
Active encouragement to creativeness and to be
Support level from staff functions
Satisfaction to company in general

Table 3: Performance measures of satisfaction areas

These elements could be measured once a year. The results could be part of the Balanced Scorecard and replies have to be visible to the relevant management level. Key employees are forming the intellectual capital of the company. These key workers have the knowledge of internal processes and typically deep understanding of main customers' requirements. It was identified and concluded, that company is losing its intellectual capital and future capabilities with every key person leaving the company. Employee retention can be measured by percentage of key staff turnover. Employee productivity is result of employees' work in the company. Result is consequence of internal processes, innovations and employee skills amongst all. Employee productivity can be measured simplest by measuring turnover per employee or output per employee. Simple measurement by employer per revenue or sales is not describing costs, profit or future possibilities, thus more precise measurement is value added per employee. External services and purchased materials are subtracted from revenue describing more precisely profitable usage of own personnel. It is remarked that revenue per employee may need balancing with other metrics, which are relying more on strategic issues. Employee motivation can be increased by giving more freedom to make decision and to take actions. Attitude towards new initiatives is found one of three most important enablers to participation and motivation in organizations according Kaplan and Norton (1996, 130-136).

In the study of Pekkola (2006, p.60) concerning motivation and performance measurement in Finnish organizations, it was found that motivation was the most important factor effecting to employee satisfaction. Motivation is depending on the organizational and cultural factors, but also company's business area is effecting on measures to increase motivation. Suitable issues and also the performance measurement metrics are development of performance measurement with personnel. Selection of awarding principles, planning of training,

improvement of communication is mentioned as measurement areas. Pekkola (2006, p. 66) found, that setting of targets, increasing of possibilities to influence and improving efficiency by developing measurement areas are mentioned as an area for performance measurement concerning work motivation.

Measuring new suggestion and innovation ideas

Amount of improvement suggestions done per employee can be measured to express the innovative culture and improvement of process. Bhagwat and Sharma (2007, p. 54) identified the following performance metrics used for innovation and learning perspective, collected to Table 4:

Performance metrics for innovation and learning perspective
Suppliers' assistance in solving technical problems
Suppliers´ ability to respond to quality problems
Suppliers' cost saving initiatives
Suppliers' booking in procedures
Capacity utilization
Order entry methods
Accuracy of forecasting techniques
Product development cycle time
Flexibility of service systems to meet particular customer needs
Buyer–supplier partnership level
Range of products and services
Level of customer perceived value of product

Table 4: List of options for the innovation and learning perspective Bhagwat and Sharma (2007, p. 54).

Innovation and learning perspective is measuring organizations' ability to change according organization's strategic targets to meet customer requirements with products and offering differentiation. Organization is strengthening its financial ability to attain more profit, reduce costs with new products and services, but also with improved personnel skills. (Bhagwat and Sharma 2007, p. 55)

Personnel are executing strategies and targets of companies. The Balanced Scorecard has notified the importance of measuring personnel satisfaction and related areas as one of the four perspectives. As the Balanced Scorecard has been said to be not only a performance

measurement system, but also a management system, the learning and growth is essential part of performance measurement. "As organizations invest in new capabilities, their success (or failure) cannot be motivated or measured in the short run by the traditional financial accounting model." Kaplan and Norton (1996, p. 18) is continuing: "While retaining financial measures of past performance, the Balanced Scorecard introduces the drivers of future financial performance."

3.4 Supply Chain management measurement with balance score card framework

A supply chain is a single main process between several organizations and companies. In this respect balanced performance measurement has a significant linkage to balanced performance measurement of operative procurement process, although procurement process is covered mainly in one organization or a company. In the study of supply chain performance measurement in the Balanced Scorecard framework, Bhagwat and Sharma (2007, p.44) have described the Kaplan and Norton's Balanced Scorecard as set of metrics to keep balance between long term and short term objectives, financial and non-financial measures, balance of leading and lagging indicators and between external and internal perspectives.

In the study of Bhagwat and Sharma (2007, p. 56) supply chain performance has been studied in Indian small and midsized enterprises. Performance measurement with balanced four perspectives is defined and most suitable measures are selected for supply chain performance measurement. Found performance metrics are common for performance measurement of the supply chain, and likely these metrics can be utilized also in the purchasing or any other process. Internal process metrics can be adapted to the purchasing or other process. Financial perspective metrics may be adapted to the purchasing process, especially concerning of process efficiency and cost management metrics. Customer perspective and learning and innovation perspective metrics may be adapted to purchasing process with some adjustments. Found typical performance metrics are presented in Table 5.

Performance metrics for the financial perspective
Customer query time
Net profit vs. productivity ratio
Rate of return on investment
Variations against budget
Buyer–supplier partnership level
Delivery performance
Supplier cost saving initiatives
Delivery reliability
Cost per operation hour
Information carrying cost
Supplier rejection rate

Performance metrics for the internal business perspective
Total supply chain cycle time
Total cash flow time
Flexibility of service systems to meet particular customer needs
Supplier lead time against industry norms
Level of supplier's defect free deliveries
Accuracy of forecasting techniques
Product development cycle time
Purchase order cycle time
Planned process cycle time
Effectiveness of master production schedule
Capacity utilization
Total inventory cost as:
Incoming stock level
Work-in-progress
Scrap value
Finished goods in transit
Supplier rejection rate
Efficiency of purchase order cycle time
Frequency of delivery

Performance metrics for the customer perspective
Customer query time
Level of customer perceived value of product
Range of products and services
Order lead time
Flexibility of service systems to meet particular customer needs
Buyer–supplier partnership level
Delivery lead time
Delivery performance
Effectiveness of delivery invoice methods
Delivery reliability
Responsiveness to urgent deliveries
Effectiveness of distribution planning schedule
Information carrying cost
Quality of delivery documentation
Driver reliability for performance
Quality of delivered goods
Achievement of defect free deliveries

Performance metrics for the innovation and learning perspective
Supplier assistance in solving technical problems
Supplier ability to respond to quality problems
Supplier cost saving initiatives
Supplier's booking in procedures
Capacity utilization
Order entry methods
Accuracy of forecasting techniques
Product development cycle time
Flexibility of service systems to meet particular customer needs
Buyer–supplier partnership level
Range of products and services
Level of customer perceived value of product

Table 5: Performance metrics of supply chain performance measurement (Bhagwat and Sharma 2010, p. 56).

In the study of Sillanpää (2010, p. 94) three important areas were found for the performance measurement. The supply chain performance is measured in the main operations with financial and non-financial metrics and also quantitative and qualitative measures. Also Sillanpää (2010, p. 94) found, that non-financial metrics have been credited for presenting more valuable information than basic financial ones.

3.5 Metrics cards

Designing of the performance measuring system requires appropriate information from processes and a company. For successful design Neely et al. (1997, p. 1150) identified the following information to be essential not only for designing, but important also for implementation and usage. The performance measurement metrics design basis may be recorded with a metric card consisting of the information proposed in Table 6:

Data of Performance Metric Card Including Definition
Title - Name of metrics
Purpose - Why this metric have been chosen?
Relates to - Issues which metric is related and connected
Target - What are target status, figures or status for the metric?
Formula - How metric is calculated?
Frequency of measurement - How often metric is calculated or reported?
Frequency of review - How often metric is reviewed?
Who measures? - Who is responsible for measurement?
Source of data - Where the data comes from, ERP's, reports?
Who owns the measure? - Who is accountable for metrics results?
What do they do? - What are the conclusions and actions based on metrics?
Who acts on the data - Who is responsible for analysing and completion of actions?

Table 6: Proposed data to be collected into Metrics Cards.

Essential issues and responsibilities concerning performance measurement system and metrics can be defined with questions described in Table 6. According Neely et al. (1997, p. 1151) these issues should be clarified during the designing phase, in order to nominate responsible persons and to have enough time to analyse essential issues. Questions in Table 6 are also securing that these metrics are measuring correct metrics presenting targeted issues. As well by questioning these questions, organization is challenged to figure out if metrics data is relevant and targeted performance can be reached. And organization is challenged to think, if these metrics are eventually needed at all.

3.6 Evaluating structure and effective indicators of performance measurement

According the study by Cardinaels and Veen-Dirks (2010, p. 577) performance measuring system is more effective when defined in the Balanced Scorecard form. Also performance measurement system is more effective if there are placed markers indicating achieved results compared to target values.

In the study Cardinaels and Veen-Dirks (2010, p.577) used markers as signs indicating how well target was achieved with good results. According the study of Ukko (2009, p. 14)

performance measuring system is effective when information is shared and communicated with operators, performance measuring system is a part of rewarding system and when operators' work targets are linked to organization's targets. Substantial influence was found with a good connection to a rewarding system. Possibilities to participate in decision making have only limited influence, which is quite an amazing result. The operative level performance measuring system has influence to personnel, if performance measuring system has a clear connection to unit's targets. Substantial influence is obtained, if the performance measurement system is connected to a rewarding system or there is interactive communication based on the performance measurement system (Ukko 2009, p. 65).

3.7 Identified difficulties with performance measurement system implementations

In the study of Cavalluzzo and Ittner (2004, p 246) few typical difficulties was identified in designing of a performance measurement system. These problems represent a major obstacle to a successful implementation of performance measurement in private and public sector. "Many of these problems relate to the ability of existing information systems to provide required data in a reliable, timely, and cost effective manner " is concluded by Cavalluzzo and Ittner (2004, p. 246). Related factors of performance measurement system implementation have been collected in Figure 10. These difficulties can be avoided with appropriate designing.

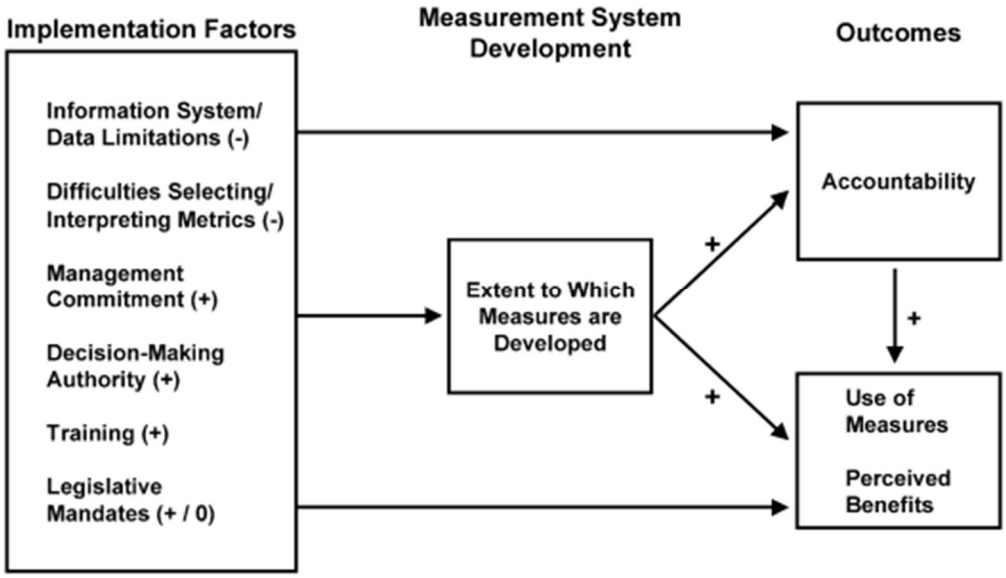


Figure 10: Main factors of measurement system development. Cavalluzzo and Ittner (2004, p. 246)

According Cavalluzzi and Ittner (2004, p. 256), most companies have limitations in the information technology for making rapid and consolidated conclusions. Nearly 60% of respondents have limitations in their IT-systems hindering usage of strategic performance measures. Even 22 % did not trust on the IT- systems captured data and 57 % were forced to capture at least some data manually. It has also been found that 44 % of the Balanced Scorecard implementations have problems or a major problem originated from lack of highly developed information systems.

Results of the Cavalluzzo and Ittner (2004, p. 256) study concerning US Government's performance measurement applications are revealing difficulties determining meaningful measures or results. These factors have significantly dampen the extent of performance measurement system development. "We find strong and consistent evidence, that difficulties selecting and interpreting metrics have a negative impact on performance measurement implementation. These results suggest that problems identifying appropriate measures and understanding their causal relationships will be particularly important as more public and private sector organizations attempt to implement systems to measure ‘‘intangible assets’’ and ‘‘intellectual capital,’’ and to develop organizational models of leading and lagging indicators of performance" Cavalluzzo and Ittner (2004, p. 259) noticed." We find that performance measure development and accountability are hindered by factors such as

inadequate training, the inability of existing information system to provide timely, reliable, and valid data in a cost effective manner, difficulties selecting and interpreting appropriate performance measures, lack of organizational commitment to achieving results, and limited decision making authority " (Cavalluzzo and Ittner 2004, p. 265).

On the basis of the Cavalluzzo and Ittner study (2004, p. 265), remarkable effort is needed to define a reliable and cost effective data interface to a performance measuring system. With adequate training, selection of the most reliable and appropriate performance measures and organizational commitment, there are good possibilities of successful implementation of a performance measuring system.

4 PURCHASING PERFORMANCE MEASUREMENT

4.1 Performance measurement of purchasing process

The process is defined as a sequence of activities or tasks completed by a person, group, team and set of equipment or their combination. Process outputs are often inputs to another process. Also processes have variations of different causes, but by reducing variations process output quality is higher at lower cost notifies Cartin (1999, p. 93). Processes which are interrelated to each other are acting like supplier and customer by supplying output of another process. Cartin (1999, p.94) defined simply that high quality processes are achieving intended results and are satisfying customer requirements. The resource usage is efficient and process displays variability at lowest economically achievable level, key quality measures are used to asses performance and process is adding value to organization's objectives.

Purchasing process is set of successive actions creating purchase orders to meet company's demands and requirements. The purchasing process is covering actions sending and handling enquiries, negotiations and decision making for most suitable suppliers, but recently basic order making has been automated or even transferred to suppliers. (Sakki 2009, p. 42)

The generic purchasing process is defined by van Weele (2010, p.30) to have steps for scope definition, supplier selection, contract agreement, ordering, expediting and evaluation. The process steps are presented in Figure 11. Scope definition is a combination of technical and commercial requirements, specifications and these requirements may be changed according to communication with suppliers. The supplier selection is including required actions to select the best possible supplier. In this process step, it is also included method of subcontracting, preliminary qualification of suppliers, preparation of documents and suppliers for enquiries. Placing of purchase order is the step including negotiation of contractual terms and finally placing a purchase order or an agreement. Expediting is actions securing deliveries in time and monitoring fulfilment of contractual obligations. The purchase process is completed with "follow up and evaluation" -step. Supplier evaluation, possible claim management and relevant documentation are covered in this step.

Figure 11: Generic purchasing process (van Weele 2010, p. 29).

Generic purchasing process is refined in the case company to meet stakeholders' expectations and requirements. In the case company the purchasing process is defined to have the six steps presented in Figure 12. These steps include typical purchasing tasks, but scope definition is done by stakeholders to enable correct item deliveries and technical knowledge.

Figure 12: Purchasing process in the case company.

The purchasing process in the case company is defined in general to consist of six actions. This process description is defined and standardized to cover all purchasing process actions in the case company and therefore the process has minor variations in different purchasing teams. The first step is to identify the need and approve the request. This action on stakeholders´ responsibility to define in reasonable depth the quality and volume of needed items. Approving the request is essential to authorize the purchaser ordering the goods or services on stakeholders' account. Assign source of supply is an action for the purchaser to determine if existing frame agreements are used or enquiry process is executed to find and select the most suitable supplier. To create a purchase order or a contract step is consisting purchasers' actions to create and sign the official purchase orders. Order confirmations are required and attached to purchase orders. Step of receive goods or services is an action, which is mainly done in warehouses or stakeholders using the services. Purchaser and accounting is requiring confirmation from incoming inspection if the deliverables have been delivered as ordered. To pay invoice is the last part of the purchasing process as purchased deliverables are paid according to purchase order specifications. The purchaser is allowing invoice payment, but not handling money transfers themselves.

4.2 Purchasing performance

The purchasing performance measurement is a challenging and an unclear issue according to van Weele (2010, p. 301). There is no universal approach determined yet to measure purchasing performance, despite of the importance of purchasing function to different type of companies. Purchasing organizations have established performance measuring systems according their own, local needs and according to the understanding of local purchasing managers. The purchasing organization performance is often measured by the effectiveness and the efficiency.

The role and the importance of the purchasing function have impact on respective performance measurement issues as presented in Figure 13. Van Weele (2010, p.303) noted that purchasing performance measurement has a connection to the role and to the importance of purchasing in a company. Van Weele (2010, p.303) divided the role and position of a purchasing in a company with four categories. Purchasing is seen in different companies as an operative and administrative activity, a commercial activity, to be part of an integrated logistics and a strategic business area. When purchasing is seen as an operational and administrative activity, purchasing performance is typically measured e.g. by amount of orders, order backlog, purchasing process lead time. Typically the purchasing position is low in the hierarchy in operative and administrative viewpoint. When the purchasing is viewed as a commercial function, the performance is typically measured by savings, price reduction, ROI-measures and inflation reports. Within this viewpoint the purchasing is reporting to the management, annual targets are agreed for the price and cost reductions. The purchasing is also seen as part of an integrated logistics instead of price hunting van Weele (2010, p. 303) concludes. With this viewpoint the purchasing is securing deliveries, enabling quality improvement actions, reducing inventory and payment terms together with reducing lead times and improving suppliers' delivery performance. Hierarchically the purchasing is integrated to other material-related functions within this viewpoint. With the strategic business area - viewpoint, the purchasing is involved to make-or-buy - studies, challenging local vendors with global competition. The performance is measured typically with amount of realized savings, number of supplier base reduction, number of new contracted international suppliers and also amount of revenues generated by new business areas.

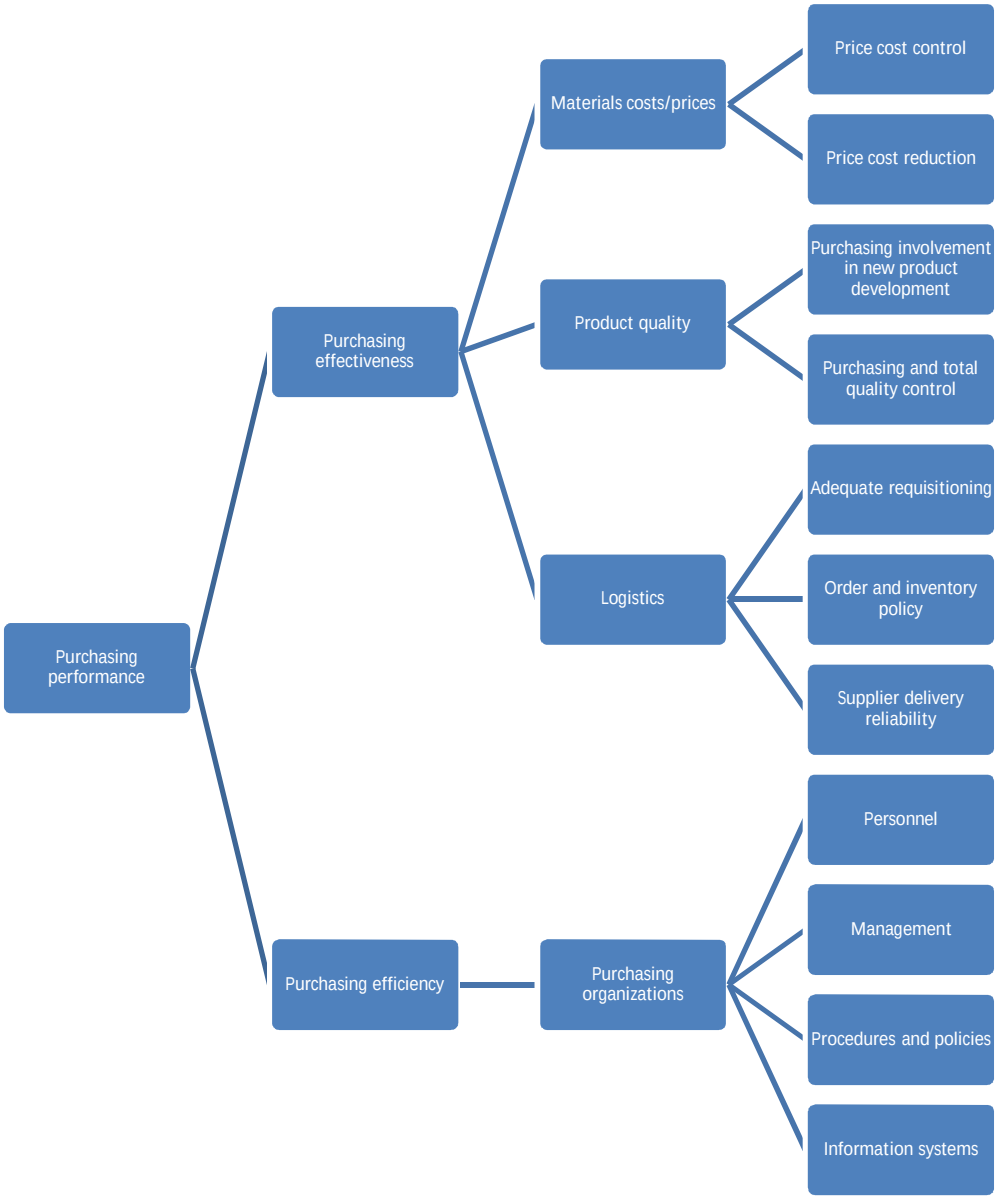


Figure 13: Purchasing performance measurement key areas, van Weele (2010,p. 306)

4.3 Purchasing Skills and Capabilities

Suitable purchasing skills and capabilities have been studied by Tassabehji and Moorhouse (2007, p. 56) as the role of procurement has been changed. At the same time the macro-economic has been changed, internet based systems and increased globalization have effected to procurement and purchasing. Purchasing has been facing the change from a transactional and commercial orientation to value delivery strategy. The increased specialization has been noted with move from purchasing function to processes, from

transactions to a relationship management and importance of a supply chain management. Expanding of core processes to manage more widely supplier coordination, cost analysis, strategic planning and international outsourcing are needed to maintain purchasing organizational competitiveness. These changes are requiring modern type of skills; the existing skills are needed to be updated in order to contribute effectively to the financial, operational and strategic success.

The procurement skills are grouped in five categories as follows: Technical skills are required for administrative operations. These skills are product knowledge, computer literacy, quality management and legislation knowledge. Advance procurement process skills are revealed for category management, global sourcing and detailed cost driver analysis. Utilizing and managing effectively the e-procurement technology and related processes, optimizing supplier selection has been noted as new skill requirements in a purchasing process. Interpersonal skills are needed to successful interactions in teams and on an individual level. Interpersonal skills are including oral and written communication and conflict resolution. Important skills are affecting to group dynamics, influencing and persuasion. Also skills concerning leadership, problem solving and awareness of interpersonal and cultural aspects importance is revealed in Tassabehji and Moorhouse (2007, p. 59) study. Interpersonal enterprise skills are related to overall business and knowledge of how different functions are interacting. These skills are consisting of for example market analysis, internal relationship management, evaluation of global sourcing, internal change management and planning skills. External enterprise skills are related to supply chain and network managing skills. Strategic business skills are related to broader strategic issues delivering added value to the organization. These skills are covering issues like planning and managing strategic partnership and alliances, risk management and naturally additional value adding issues.

Based on issues mentioned before, it is important to define required skills and capabilities to reach strategic targets of the purchasing personnel. Personnel skills and competences may be improved towards targeted state and competence development measured.

5 PURCHASING PERFORMANCE MEASURING SYSTEM DESIGN AND TEST USE

5.1 Research design

The empirical research was executed by designing of purchasing performance measurement system in the case company. Purchasing in the case company is organized in three teams covering five purchasing processes with small variations. The performance measurement system was designed with balanced perspectives and system's operation was tested in the case company. During the test use, improvements were done with several changes and finally most suitable balanced performance measurement system established to the case company.

5.2 Case company

The case company is a global corporation located in Finland. The selected purchasing organization is a part of Procurement - business unit in the company. Procurement is covering all indirect spend in the company with strategic sourcing activities and stakeholders' requests purchased with the purchasing processes. The strategic sourcing is recently established to focus on future agreements and the purchasing process is ordering goods as requested by internal stakeholders. The purchasing is covering mainly locations in Finland, but also global units are assisted. The Procurement - business unit's strategic targets have been defined for the following 3 years. The main targets for the performance of the purchasing have been defined with a new centralized organization. Previously the purchasing operations have been part of each stakeholder's business. With the centralized purchasing organization, the common process can be defined and the strategic sourcing benefits obtained especially by focusing purchases to selected suppliers and using same agreements in all corporate locations whenever it is suitable.

The case study is made for the purchasing processes of the case company's indirect procurement spend. The indirect procurement consists of all other purchasing than raw materials. The major parts of the purchasing operations are covering maintenance related materials and services and investment related materials and services. The purchased volume in the scope of this study is annually around 300 M€ purchased by roughly 20 persons.

The purchasing has been organised into three teams: materials team, chemicals and services team and shipping team. The materials team and the chemicals & services team have different processes for the capital expenditure purchasing process and operational expenditure purchasing. The shipping team has an own process with an own ERP-system, which ships are using for operation and maintenance work. Ships personnel are sending purchase requests from seas abroad to purchasers located in the office.

In the case company, the purchasing process is covering operational and capital expenditure for goods and services. Also chemicals, additives and other related items are covered with the purchasing process, but e.g. administrative purchases like office goods, ITC goods and services are ordered by a category manager or by a software application. The purchasing process in the case company is covering continuous ordering of maintenance related goods and services and also new project purchases. Requests for proposals and purchasing orders are covered in this process, but not receiving of goods or warehousing, which are on stakeholders' responsibility.

The procurement strategy has been annually updated for the next three years. Strategy is communicated in corporation with Figure 14 presentation covering major tasks and priorities.

Figure 14: Case unit's strategy for 2013 -2015.

The procurement organization's strategic target has been defined to create jointly with business substantial and sustained added value as presented in Figure 14. The strategy implementation is divided in three main areas: procurement leadership, sustained added value and world class performance. Each area has few main actions to be executed on the strategy planning time frame in order to reach the strategic targets. The main strategic actions in the purchasing process are: to secure realized benefits, to improve efficiency and responsiveness of purchasing. Also the implementation of a supplier management, enhance safety and overall performance of contractors together with deepen competences and establish career paths are key actions to meet Procurement unit's strategic objectives. On the basis of unit´s performance is operative purchasing and inspiring leadership.

5.3 Data collection and analysis

The case company's performance measuring system was designed on the basis of SAKE performance management system. SAKE is designed with Microsoft Excel enabling small and mid-sized companies' easy entrance to start measuring its performance. SAKE performance measurement system is easy to design and suitable to case unit's several purchasing processes and also adapt to several enterprise resource planning systems, ERPs.

The purchasing organization has four main ERP-systems in use. IFS Application software, called M+, has been used for operational expenditure purchases for goods and services. The capital expenditure materials and services have been ordered with Lean software purchasing module. The operational expenditure purchases for ships have been done with Amos software. Foreign units are using another IFS Application's ERP, called Bio+, this ERP has an own database, and software is more or less English version of M+ ERP used in Finland. Data collection to the performance measurement system is challenging to cover four different software applications. Used applications have their own standard reports and data is easily transferred to Excel for additional analysis from each ERP. Internal business process and financial perspectives performance data is collected from ERPs to MS Excel sheets analysed and updated to SAKE performance measurement system manually. Competence and growth as well as development actions' inputs are gathered with an own MS Excel sheet from teams and results are manually typed to SAKE MS Excel-sheet. The supplier and stakeholder

perspective actions are also gathered from the teams with MS Excel sheets and results are stored to SAKE.

5.4 Evaluation of the research

The performance measurement system is evaluated by the accuracy and how suitable performance measurement system is to measure purchasing performance in balanced way. The performance measurement system used in this study is evaluated on the ability to monitor targeted performance, usability of the performance measurement system and how well performance measurement system is giving appropriate information.

Ability to monitor the targeted performance is evaluated by the actual performance results by time span. The usability is evaluated by the easiness of producing accurate measurement values. Flexibility in setting targets and scaling of results is an important feature for performance measurement systems with high volume changes. This ability is additionally evaluated in the research.

6 PURCHASING PERFORMANCE SYSTEM DESIGN AND USE - FINDINGS

6.1 Case company and purchasing process

In the case company the purchasing process is adapted to the business unit's needs and targets. The purchasing process is executed with case unit's purchasing personnel with stakeholders' computer systems. The purchasing process is covering operational expenditure for maintenance of manufacturing units in Finland as presented in Figure 15 below. Capital expenditure purchases are executed mainly for the stakeholders business units' located in Finland.

The purchase process is consisting of enquiries, commercial and technical evaluation, negotiations, creation of purchase orders and expediting. The purchasing processes of the materials and the services purchasing have some deviations. These deviations are related to purchasers' individual differences, to expediting actions and also to the computer systems functions. Naturally these differences have effect on daily work and have impact also to the performance measurement system.

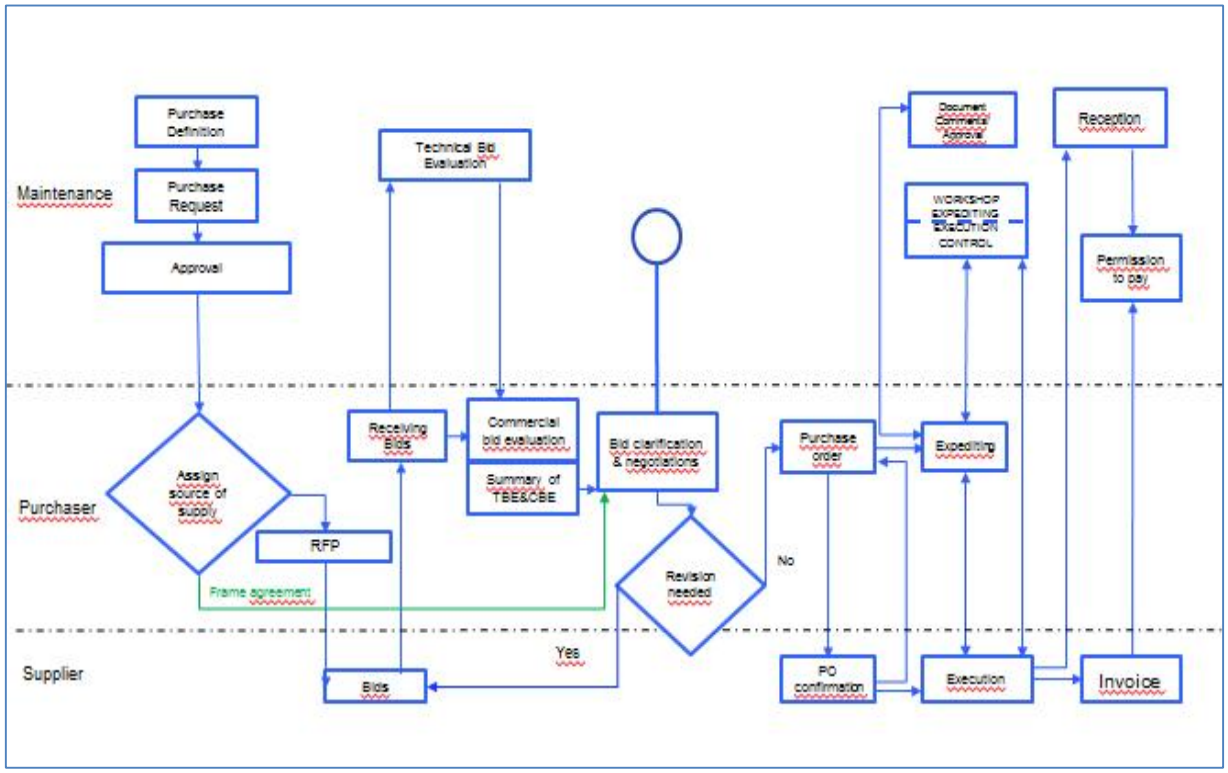


Figure 15: The purchasing process for operational expenditure of the case company.

In the case company annual spend of capital investment is typically around 100 million euros and more if remarkable projects is executed. Planning and execution of capital investments are done by an engineering company with agreed processes and purchasing. Strategic sourcing concerning these goods and services are done by the case unit. The investment purchase process presented in Figure 16 is adapted to investment projects' management actions. In the investment projects, the project manager of the engineering company is approving the purchase requests delivered to purchaser. Purchaser is selecting the source of supply i.e. use frame agreements or start the RFP -process as presented in the flowchart presented in Figure 16. The first priority is to use frame agreements whenever applicable. In negotiations the complete scope of the purchase is negotiated with suppliers, the purchasers and the project manager. If frame agreements do not exist or they are not applicable to requested goods or services, the RFP -process is started. Purchaser is creating enquiries; sending them to approved suppliers and receiving offers. Received offers are analyzed with technical and commercial evaluation. Technical issues are evaluated by engineering responsible and purchaser is evaluating commercial issues. Purchaser is proposing the most economical solution from the technically acceptable ones for the project manager for approval. Project manager is approving purchase securing suitability to project's entirety prior purchaser is making purchase order. Quite often bid clarification meetings are required to share requirements and execution possibilities. Also during the evaluation process negotiations are held with the most suitable candidates.

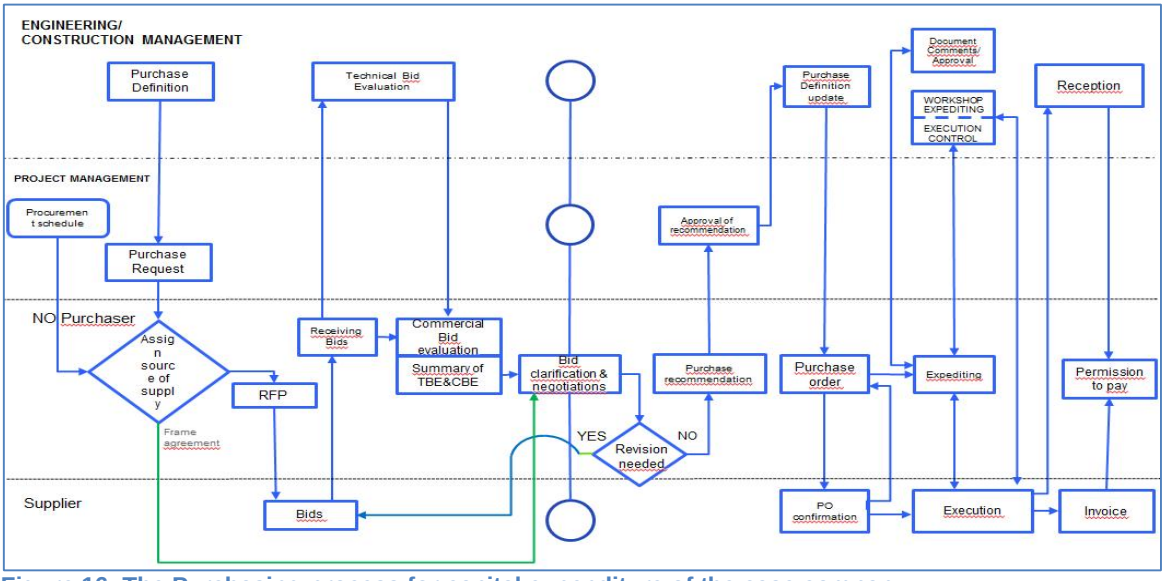


Figure 16: The Purchasing process for capital expenditure of the case company.

6.2 Designing performance measurement system to case unit

The framework of the balanced performance measurement system to purchasing process has been designed based on the experience and knowledge from the literature and tested in the case company. The main importance has been placed for balanced performance measures and also connection to the strategy, which is presented in the middle of the Figure 17 describing framework of the performance measurement system.

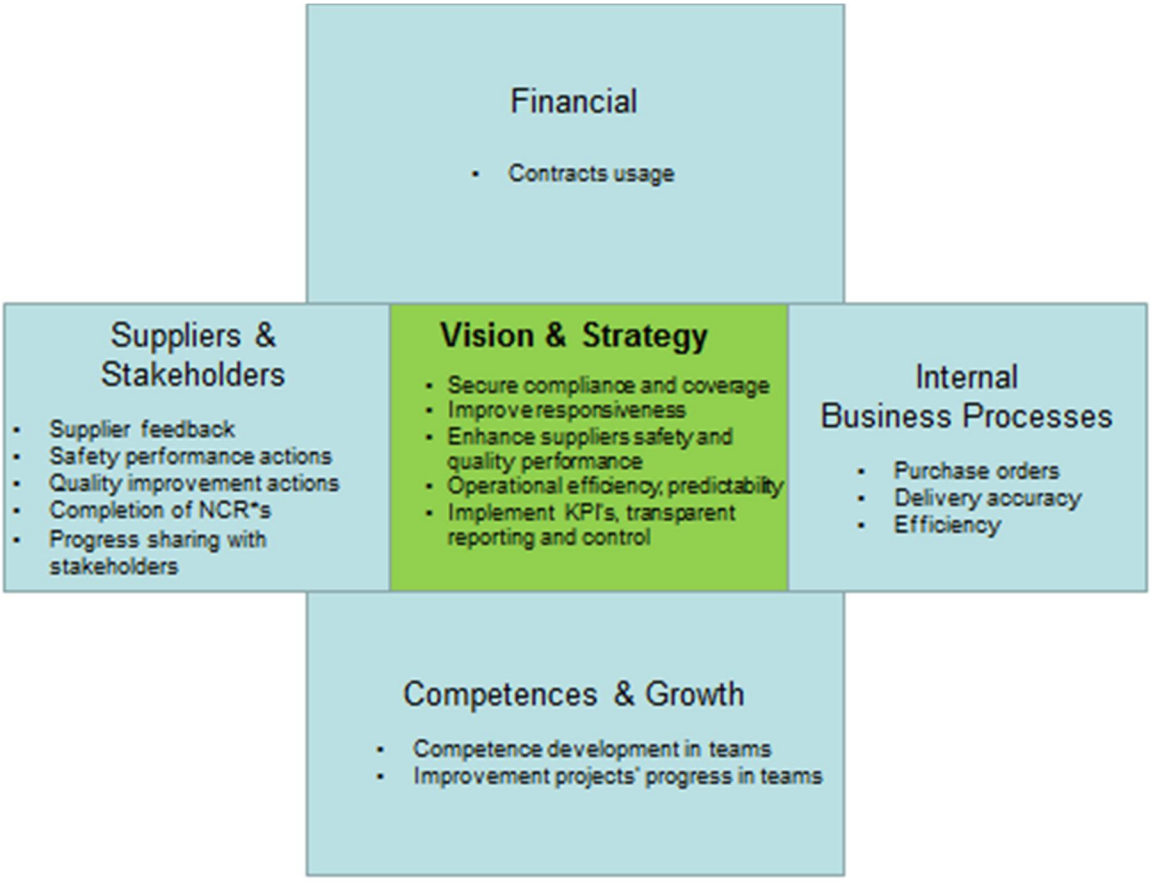


Figure 17: Framework with selected views and metrics of balanced performance measurement system for the case unit.

Balanced performance perspectives and measures are defined based on the environment requirements and possibilities. This framework is adapted to the environment consisting of five slightly different types of processes. The balanced performance measurement system's designed measuring perspectives are financial, internal business processes, competences & growth and suppliers & stakeholders as presented in Figure 17. The financial perspective is measured by the ratio of frame agreements used from all purchase orders; the performance metric is called "Contracts usage". The internal business process is measured by purchased

orders amount in teams, delivery accuracy and efficiency. The competences and growth - perspective is measured by the amount of completed competence development actions and proposed or executed development actions in teams. The supplier and stakeholder perspective is measured by the amount of supplier feedback, safety performance actions, quality improvement actions, amount of completed non-conformities called NCRs and progress sharing with stakeholders.

The purchasing performance measurement system's organizational areas are materials, services & chemicals and shipping. The materials and the services and chemicals areas have operational and capital expenditure purchase processes. Each of these three areas has an own team leader as accountable for the area performance as presented in Figure 18.

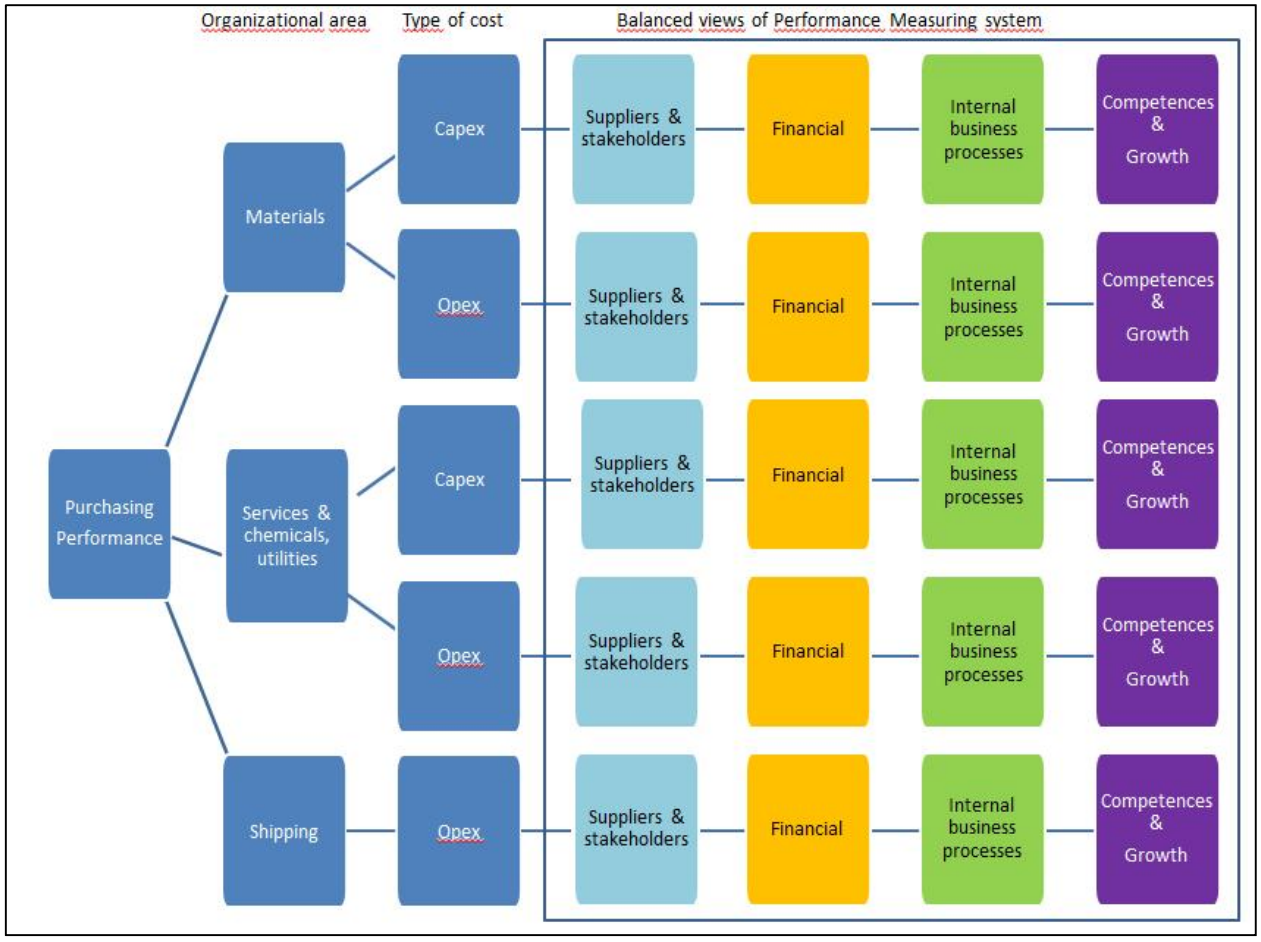


Figure 18: The organizational areas and processes of performance measurement system in the case unit

The performances of the five different purchasing processes in three managerial areas are measured with four perspectives. The performance areas are based on the managerial areas: the materials team, the services and chemicals team and the shipping team are all led by an own team leader. The performance of each organizational area is cascaded finally to one purchasing performance measurement result. The purchasing processes are divided to operative and capital expenses mainly because of different ERP-systems and also as the purchasing process have some minor differences. The shipping team has an own ERP-system and also the purchasing process is different compared to other four processes.

The designed framework has balanced performance perspectives derived from the unit's strategic targets and adopted to the existing process and environment. The performance metrics have been evaluated to express the process performance related to these set targets. Suitable metrics have been listed and evaluated presenting performance progress in relation to set targets with available data.

There are three main computer systems used for purchasing process in the case company, related performance measurement data is selected to be suitable for easy data capture and all proposed performance metrics are presented in the Appendix 4. In this list, suitable performance metrics are collected from literature, personnel and business partners. Process, objective descriptions and formula are described for performance metric creation and also for evaluation of each metric's suitability. All process performance data is collected from ERP-systems with MS Excel sheets and analysed prior consolidating to performance measurement system. As the process metrics are including large amount of data, source of data and easiness of data transfer to MS Excel sheet is important selection criteria. Major part of proposed performance metrics is suitable to existing ERP- systems and only a few metrics were not suitable for performance measurement or not linked to existing strategy. It seems that the list of appropriate performance metrics is proposed with a good understanding of what really can be measured and unrealistic ideas are eliminated already in first planning discussions.

6.2.1 Performance measuring of financial -perspective

The procurement's main target is to create, jointly with the stakeholders', substantial and sustained added value. The performance of the financial perspective is measured by share of order lines purchased based on the frame agreements, metric called as contract usage. This performance metric is reflecting how well frame agreements have been utilized in the purchasing process. The purchaser is accountable to assign source of supply for each purchase order line. Strategic sourcing in the case company is gathering major part of the purchases under frame agreements, which are creating purchasing power and other sustained benefits. Thus it is financially prosperous to use the frame agreements as much as possible, and also to execute sourcing projects to areas, where new frame agreements are needed and beneficial. The performance metric of the contract usage has been divided into the teams with same kind of purchasing activities. Figure 19 is presenting financial performance sub metrics in teams. In Figure 19 are presented performance measurement parameters. "MITTARI" is the header of all six sub metrics, "TULOS" is reached value, "TAVOITE" is target value, "ARVOSANA" is calculated value from PMS scaling function, and "PAINO" is priority weight. These parameters are calculated to perspective's performance value "OSA-ALUEEN SUORITUSKYKY".

Contracts usage - Financial

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
AIE M+ contracts usage	0	35	0	10 %
MRO M+ materials	18,06	35	4	25 %
Chemical M+	29,37	35	8	25 %
Service M+	0	35	0	25 %
Repro Mat + Service	40,49	35	10	15 %
Shipping usage	10	35	1	0 %
			OSA-ALUEEN SUORITUSKYKY	4,5

Figure 19: The performance measurement metrics of the financial perspective

The financial performance measurement data is captured from the used ERP-systems. The capital expenditure purchasing is made with the Lean- system and the operational expenditure purchases are made with the IFS Application system. The monthly purchases are reported to the MS Excel; team or process based analysis is calculated manually.

The purchasing process is executing strategic purchasing contracts and frame agreements when they are applicable. Within these frame agreements the purchasing volume has been consolidated and also the future requirements are included to frame agreements during the sourcing project. Based on this, the company will reach the better financial result with the better usage of frame agreements. By usage of the frame agreements, the purchased items may be consolidated, amount of parallel items will be reduced and required new items will be added to the frame agreements in the future. The frame agreements have often additional savings bonus, based on the annual volume which will give additional financial benefit to the company if the frame agreements are used. The agreement usage is measured by the ratio of purchase order lines marked with the contract identification code divided with all purchase order lines. The contracted lines ratio has increased as frame agreements have been implemented to use. Still monthly variation is remarkable. The main target for this metrics is to promote the usage of the frame agreements for purchasers to ensure the implementation of the strategic sourcing for each category.

The contracted purchase order lines have been increasing with delay after more frame agreements have been signed. The amount of contract based order lines has increased by 58 % from 15, 7 % to 21, 0 % as the volume of purchase order lines have increased. The ratio of the contracted order lines versus total order lines have increased, but the amount of purchase order lines increased form 15 648 lines in 2011 to 27 955 lines in 2012. The ratio of the contracts based order lines has changed a lot on both directions, because of changes in purchasing areas and the demand of the required goods or services have increased. The frame agreement usage -metrics have been defined to each purchasing team. The personal metrics may also be used, but the frame agreements do not cover all purchasing areas resulting unfair results between the purchasers. It was estimated that the team based calculation of the financial perspective performance should be more constant and reflect more accurately real performance.

It was found remarkable changes in the ratio of the contracted order lines in the monthly summary of the teams. This is reducing reliability of the performance metrics. The contracted ratio has been changing from the AIE - team's 5.1 % in December 2012 to 34.7 % in January 2014 and summary of the last quartile of 2012 the same ratio was 1.9 %. The figures of the service -team in 2012 are remarkably different than January 2013 values. In January 2013 the contracted ratio for operational expenditure purchasing has been between 34.6 % and 54.8 %, capital expenditure ratio has been 46.4 % in December 2012. Based on these foundlings, target values were set by January 2013 figures and the target have to be evaluated month by month during the year 2013.

The target values for each team or process area have been set to 35 % which is giving "Taso 5" in the SAKE performance measurement system as shown in Figure 20. The scale of the target values have been defined between 80 % and 120 %. The target value is set to scale 5, the minimum threshold to scale 0, which is calculated 80 % of the target value and the maximum 120 % for the scale 10.

MITTARI	Contracts usage TM AIE M+	Contracts usage TM M+	Contracts usage Chemicals M+	Contracts usage Service M+	Contracts usage Capex Repro	Contracts usage shipping
KAUDEN TULOS	34,7	34	6	40,8	54,8	30
Taso 10	42,00	42,00	42,00	42,00	42,00	42,00
Taso 9	40,60	40,60	40,60	40,60	40,60	40,60
Taso 8	39,20	39,20	39,20	39,20	39,20	39,20
Taso 7	37,80	37,80	37,80	37,80	37,80	37,80
Taso 6	36,40	36,40	36,40	36,40	36,40	36,40
Taso 5	35,00	35,00	35,00	35,00	35,00	35,00
Taso 4	33,60	33,60	33,60	33,60	33,60	33,60
Taso 3	32,20	32,20	32,20	32,20	32,20	32,20
Taso 2	30,80	30,80	30,80	30,80	30,80	30,80
Taso 1	29,40	29,40	29,40	29,40	29,40	29,40
Taso 0	28,00	28,00	28,00	28,00	28,00	28,00
ARVOSANA	4	4	0	9	10	1
	Nouseva parremmus	Nouseva parremmus	Nouseva parremmus	Nouseva parremmus	Nouseva parremmus	Nouseva parremmus
	Laskeva parremmuus	Laskeva parremmuus	Laskeva parremmuus	Laskeva parremmuus	Laskeva parremmuus	Laskeva parremmuus
	Käytössä:Nouseva parremmuus	Käytössä:Nouseva parremmuus	Käytössä:Nouseva parremmuus	Käytössä:Nouseva parremmuus	Käytössä:Nouseva parremmuus	Käytössä:Nouseva parremmuus

Figure 20: Metrics of the frame agreements usage

The purchasing team and process areas priority weights are determined to express metrics' effect to whole purchasing performance result for the company; these weights are presented

in Figure 21. AIE-team's M+ -area is representing 10 % of value, this area is fragmented, but the purchasing value and the importance to the company are still high. The shipping area contracted weight is 5 % as purchased goods and services are related to ships, the volume and value are minor compared with the rest. Also the purchased goods and services are often special spare parts, which frame agreements do not cover yet.

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
Contracts usage TM AIE M+	34,7	42	4	10 %
Contracts usage TM M+	34	42	4	25 %
Contracts usage Chemicals M+	6	42	0	25 %
Contracts usage Service M+	40,8	42	9	25 %
Contracts usage Capex Repro	54,8	42	10	10 %
Contracts usage shipping	30	42	1	5 %
			OSA-ALUEEN SUORITUSKYKY	4,7

Figure 21: The performance metric for the Financial perspective: Contracts usage

Figure 21 express that the defined target values are good with TM AIE M+ and TM M+ area. The chemical area contracted ratio is only 6 despite previous figures were above 33 %. These low results evince the difficulties in setting target scales to new performance measurement systems, especially if performance measured process is unstable.

6.2.2 Performance measuring of internal business process -perspective

Purchase orders

The amount of purchase orders created by a team or process area is designed to the performance metric for Internal Business Process perspective presenting different purchasing processes volume as presented in Figure 22.

Purchase orders- Process

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
AIE, M+ and Repro	156	192,5	6	10 %
M+ MRO materials	297	425,04	4	25 %
M+ Chemicals	270	278,88	9	15 %
M+ Services	51	133,406	0	10 %
Repro capex services	68	135,8	1	20 %
Repro capex Materials	30	200,2	0	20 %
			OSA-ALUEEN SUORITUSKYKY	3,2

Figure 22: The performance metric for the Internal Business Process perspective: Purchase orders

The process of purchase order creation has differences especially with the annual amount of investment purchases. Also capital expenditure purchasing process is including more negotiations and pre-work before purchase orders are created and signed. These differences are visible in Figure 22 measured and target values. AIE- purchasing team is creating maintenance related purchase orders as well as investment related purchases. The maintenance purchases are done with M+ -ERP-system where the amount of monthly purchase orders have been reported to MS Excel and analyzed by teams or process areas. The maintenance services are ordered only for special purposes with this purchasing process. The major part of services is ordered with frame agreements by maintenance department persons and therefore that volume is not covered with this metric. This metric is calculating purchases done by the purchaser in these team or process areas. The investment purchases are done with Lean- ERP-system and the data analyzed with MS Excel. This metric is reflecting how well available purchasing resources and capacity are used.

The capex purchase orders have increased last year's annually more than 50 % in same time amount of operative expenditure purchases increased only 15% from the starting of the year 2010. Therefore the target setting is based on 2012 performance results. The monthly targets are set to 10 % higher than 2012 results was proposing to increase efficiency. This increase of efficiency is designed partly to encourage rational process improvements with higher target expectations and partly to anticipate continuing increase in the amount of purchase orders.

The target amount of the purchase orders is set to present value of 5. The target figures are based on the 2012 figures which are increased by 10 % as throughput and capacity has increased yearly above 11 % in the recent years. The operational expenditure purchasing targets are based on the figures of relevant M+ purchase orders 2012 as presented in Table 7. All these operational and capital expenditure purchase orders have been summarized from the personal level to the team level in order to tolerate vacations and small variations on monthly performance.

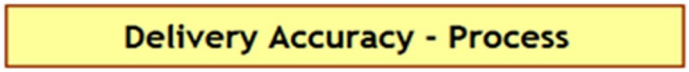
%	AIE	MRO	Chem	Service
120 %	372	1252,8	606	93,6
116 %	359,6	1211,04	585,8	90,48
112 %	347,2	1169,28	565,6	87,36
108 %	334,8	1127,52	545,4	84,24
104 %	322,4	1085,76	525,2	81,12
100 %	**310**	**1044**	**505**	**78**
96 %	297,6	1002,24	484,8	74,88
92 %	285,2	960,48	464,6	71,76
88 %	272,8	918,72	444,4	68,64
84 %	260,4	876,96	424,2	65,52
80 %	248	835,2	404	62,4

Table 7: Purchase orders amount with scale for operational expenditure purchases and teams.

In Table 7 high variations of purchasing volume between different teams is visible. It is essential to understand the differences of different work processes, when new targets and metrics are planned.

Process quality: Delivery accuracy

The delivery accuracy is the quality performance metric presenting internal business processes perspective's quality performance. One of the major interests of the internal stakeholders is that required goods or services are delivered as purchased and confirmed. This metric's sub metrics, achieved results, targets, scale value and priority weights are presented in Figure 23. The delivery accuracy is presenting how well the purchasing process is performed by reflection of time and given promises. The purchasing delivery accuracy is measured for material deliveries to maintenance and investments i.e. capital expenditure purchasing deliveries. The delivery accuracy has been measured from the reported arrivals in warehouses.



MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
AIE M+	77,52	88	0	15 %
MRO M+	85,21	88	5	30 %
Chemicals M+	92,49	88	10	20 %
Service M+	30,26	88	0	5 %
Capex, Repro Materials	69,44	88	0	20 %
Shipping	86	88	7	10 %
			OSA-ALUEEN SUORITUSKYKY	4,2

Figure 23: Internal process perspective, quality is measured with the delivery accuracy

The delivery accuracy is measured for each team and process area separately. Material warehouses are entering the delivery time, delivered amounts and notes for each receival. This data is used for invoice handling and same data is used for the performance metric.

Mantenenace receivals are the major part of total amounts of receivals. Therefore AIE, MRO, Chemicals and services M+ receivals are weighted with 70 % from all. Capex purchase orders are made with Lean ERP, in the case company called repro, but repro receivals are only consisting of material deliveries. Services deliveries are recorded to ERP only partially. Therefore the delivery accuracy performance measurement is covering only material deliveries. The shipping team's delivery performance measurement is based on the same principle. Deliveries are reported to ERP in harbour warehouse, but the purchase order is closed in the ERP-system not until the delivery is completed to the ship. The delivery performance has been measured by comparing the arrival reporting date to the agreed purchase orderlines' delivery date.. The measurement value has 7 days tolerance to eliminate reporting and transportation errors in the performance metrics. The tolerance is evaluated from the past and agreed in the case company as a standard principle.

Target values shown in Figure 24 are defined by historic results. Delivery target is set to 85 % for all teams with 88 % an excellent and 82 % as a poor result. Stakeholders noticed that

some warehouse deliveries were delivered just as ordered and not delivered before wished delivery time, despite of the urgent need. Therefore the delivery accuracy measurement has been changed and the target figures updated respectively.

MITTARI	Delivery accuracy TM-AIE	Delivery accuracy TM-opex	Delivery accuracy Chemicals	Delivery accuracy Service	Delivery accuracy shipping	Delivery accuracy capex materials
KAUDEN TULOS	92	91	90	37	88,2	58
Taso 10	88,00	88,00	88,00	88,00	88,00	88,00
Taso 9	87,00	87,00	87,00	87,00	87,00	87,00
Taso 8	86,50	86,50	86,50	86,50	86,50	86,50
Taso 7	86,00	86,00	86,00	86,00	86,00	86,00
Taso 6	85,50	85,50	85,50	85,50	85,50	85,50
Taso 5	85,00	85,00	85,00	85,00	85,00	85,00
Taso 4	84,50	84,50	84,50	84,50	84,50	84,50
Taso 3	84,00	84,00	84,00	84,00	84,00	84,00
Taso 2	83,50	83,50	83,50	83,50	83,50	83,50
Taso 1	83,00	83,00	83,00	83,00	83,00	83,00
Taso 0	82,00	82,00	82,00	82,00	82,00	82,00
ARVOSANA	10	10	10	0	10	0
	Nouseva paremmus	Nouseva paremmus	Nouseva paremmus	Nouseva paremmus	Nouseva paremmus	Nouseva paremmus
	Laskeva paremmuus	Laskeva paremmuus	Laskeva paremmuus	Laskeva paremmuus	Laskeva paremmuus	Laskeva paremmuus
	KäytössäNouseva paremmuus	KäytössäNouseva paremmuus	KäytössäNouseva paremmuus	KäytössäNouseva paremmuus	KäytössäNouseva paremmuus	KäytössäNouseva paremmuus

Figure 24: Delivery accuracy target and scaling for each measurement areas.

Efficiency

The purchasing efficiency is describing how much purchaser is using time per purchase order as presented in Figure 25. The purchasing process is creating purchase orders and used working time is divided with number of purchase orders. The purchasing process has slightly different consists of work; capex purchases normally consist more of negotiations than maintenance related purchasing. Maintenance related operational expenditure purchases are often ordered with minor negotiations with a supplier. Team members have remarkable differences in used hours per purchase orders. Working methods are quite free and purchases have different way to do purchasing orders. Often more complex purchase orders are done by certain experienced purchasers. Calculated work time used for purchase orders have changed remarkably during last years. As most purchasers are ordering with several ERPs and following capex and opex- purchasing processes, the efficiency and hour usage measurement is calculated for the teams doing the same kind of work. The average used hours per purchase order is more reliable for a team than for a purchaser, because the work load changes and e.g. sick leaves or vacations are reflecting more on the personal values.

The internal process efficiency is measuring how much time each area is using for one purchase order. In Figure 25 presented Efficiency metric's value is calculated from the sum of used working hours divided with the sum of the purchase orders in the relevant area.

Efficiency - Process

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
AIE hours /PO M+& repro	3,24	4,394	10	10 %
MRO hours /PO M+	3,74	4,511	10	30 %
Chemicals hours / PO M+	1,59	2,275	10	10 %
Services Hours / PO M+	7,03	5,629	0	10 %
Capex hours / PO repro	8,29	9,477	10	30 %
Shipping hours / PO Amos	1,23	1,755	10	10 %
			OSA-ALUEEN SUORITUSKYKY	9,0

Figure 25: Internal process; efficiency performance measurement

Each process area has little variations in the purchasing, but the main processes are calculated with the same principle. The category of automation, instrumentation and electrification (AIE) purchases have same kind of process for both maintenance and capital expenditure related purchasings. The category of maintenance, repair and operations (MRO) and the chemicals purchasing have the same process. The purchasing effiency of the capital expenditure is used hours divided with created purchase orders for both service and material purchase orders.

6.2.3 Performance measuring of Suppliers & stakeholders -perspective

The purchasing performance metrics related to the supplier and stakeholder- perspective are measured with execution ratio of agreed actions on five areas. The measured areas are presented in Figure 26: supplier feedback, safety performance actions, completion of quality performance actions, completion of non-conformances (NCR) and progress sharing with stakeholders.

Suppliers, Stakeholders

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
Supplier feedback	100	200	5	20 %
Safety performance actions	50	200	2	20 %
Completion of Quality performance actions	50	200	2	20 %
Completion of NCRs	100	200	5	20 %
Progress sharing with stakeholders	100	200	5	20 %
			OSA-ALUEEN SUORITUSKYKY	3,8

Figure 26: Stakeholder view; Suppliers and stakeholders communication

The measured figure is based on reported executed actions of all actions. These metrics are selected to ensure active working towards the stakeholders and suppliers according to the agreed strategic paths. The supplier feedback is designed to ensure that agreed feedback for the delivery performance, quality issues and other type of actions will be shared with the main suppliers. The completion of quality performance actions and the completion of NCR are also reflecting how well agreed actions concerning reclamations and non-conformances in an own process are executed.

The performance metrics, which are calculated with ratio e.g. completion ratio of NCR's are suitable measures for the quite new purchasing process. In the case unit, supplier management has been established recently and also supplier performance measurement also started, but there is only few performance indicators available at the moment. Therefore these performance metrics will be improved after the supplier management is well implemented to the supplier base.

6.2.4 Performance measuring of Competences & Growth -perspective

The competence development measurement is measuring the ratio of executed competence improvement actions per each month. The competence improvement actions are measured team wise like the improvement actions. The improvement actions are measured to ensure execution and closing of agreed improvement projects as seen on Figure 27 below.

Competences, Growth

MITTARI	TULOS	TAVOITE	ARVOSANA	PAINO
Materials team	100	200	5	20 %
Chemical, services	100	200	5	20 %
Shipping team	100	200	5	10 %
Improvement projects progress materials	100	200	5	20 %
Improvement projects progress services	100	200	5	20 %
Improvement projects progress shipping	100	200	5	10 %
			OSA-ALUEEN SUORITUSKYKY	5,0

Figure 27: Competence and growth perspective with measures in areas

The competence development is a key issue for the case unit's strategy execution. With the competence improvement it is aimed to reach more agile personnel and naturally encourage personnel on their career path towards more demanding positions. The purchasing work may change remarkably in the near future together with new ICT-applications like e-commerce and e-auctions.

Purchasers in the case unit have heterogenious competences depending the original work area or a team in which the purchaser has worked. In these own expertise areas, purchasers have a good or excellent knowledge, but somehow the competences are narrow and only few purchasers have knowledge of other team's work. In order to widen existing competences in the case unit, competence develpoment program was established in 2013.

The work process improvement actions with the continous improvement proposals are an important element to improve the efficiency, quality and also personnel's job satisfaction and

the engagement to a company. In the case company improvement proposal system is inactive at the moment, but for the performance measurement system, continous improvement is aimed to be activated. The target is one improvement proposal per month to be executed in each team.

6.3 Performance metric cards

Performance metric card has been established to present appropriate issues for each performance metrics. The performance metric card has basic information of each metric and concluding activities from the results. There are described what is measured and why, the cards are presenting the definition of each metrics and the purpose of the measurement. The metrics parameters like formula, scale, measurement interval and required actions as seen on Table 8 below.

Title	Contracts usage
Definition	The share of purchase orders made according frame agreements or contracts per team
Purpose	Maximum usage of frame agreements is ensuring financial benefits by increased realized savings
Relates to	Financial results - realized savings / Procurement KPI
Target value	100 % or maximum contract coverage for purchasing team
Scale	Result of January 2013 gives 5 - 120%=10 and 80% 0
Formula	Amount of purchase orders with agreement number divided with all purchase orders by each metrics purchasing teams
Frequency of Measurement	1 / month
Frequency of reviews	1/month
Measurement accountable	team leaders: Materials, services,shipping
Source of data	M+, Repro, (Amos)
Owner of the measurement	Purchasing manager
What actions will be executed according measurement results	Feedback to purchasers and category manager
Increasing value	Good performance / progress - celebate results
Decreasing value	Analyze purchase areas with poor coverage with purchasers and category manager Analyze purchase orders with contracts available but contracts not used
Responsible to act	Purchaser
Accountable to act	Team leader
Linkage to strategy	First level linkage: Realized savings
View	Financial

Table 8: Metric card for Financial perspective metric "contract usage".

The contract usage performance metric is defined with the available base data from the ERP-systems as presented in Table 8. In the metric card the accountability of performance measurement results is defined to the team leaders, the actions after increasing or decreasing values are described to ensure the good performance results.

7 PERFORMANCE MEASUREMENT SYSTEM - RESULTS OF THE CASE

7.1.1 Test use

The performance measurement system is defined to measure performance of the purchasing process in the case company according unit´s strategic targets. The balanced performance measuring system for the purchasing process is defined with internal process perspective, financial perspective, stakeholder & suppliers' perspective and competences & growth perspective. The performance measurement system data is entered manually from ERP's reports. Also manually gathered information from other applications is used. The performance measurement system is designed and tested in normal use and performance measurement system is improved during the test use. Test results are analysed for reliability and usability of metrics with users and management team.

7.1.2 Findings

Performance measurement system

The performance measurement system is defined to measure the performance of five major processes and three organizational areas. Several purchasers are doing purchasing tasks on more than one process as presented in Table 9. Different type of the purchasing process may be identified up to 11 processes; all these processes can be measured one by one to gain more accurate performance measurement, but it is not viable.

RESOURCES			ERP					Processes								
								Materials			Chemicals		Services			Shipping
Managerial area	Purchaser	Team	M+	Bio +	Repro	Amos	Other	AIE	MRO	Material capex	chemicals	chem materials	service opex	service capex	Shipping	
TL1	a1	Chemicals	x									x				
TL1	a2	Chemicals	x									x				
TL1	a3	Service capex	x	x	x				x				x	x		
TL1	a4	Service capex	x		x								x	x		
TL1	a5	Service capex	x		x		x				x			x		
TL1	a6	Service capex	x											x		
TL1	a7	Service capex	x		x								x	x		
TL1	a8	Palvelu opex	x										x			
TL1	a9	Service, Chem	x									x				
TL2	a10	AIE	x		x			x								
TL2	a11	AIE	x		x			x								
TL2	a12	AIE	x		x		x	x								
TL2	a13	AIE	x		x			x	x							
TL2	a14	Material capex	x		x				x	x						
TL2	a15	Material capex	x		x					x						
TL2	a16	Material capex	x		x					x						
TL2	a17	Material capex		x	x		x			x						
TL2	a18	Material capex	x						x							
TL2	a19	MRO	x		x				x	x						
TL2	a20	MRO	x						x							
TL2	a21	MRO	x						x							
TL2	a22	MRO	x						x							
TL3	a23	Shipping	x	x		x			x							x
TL3	a24	Shipping				x										x

Table 9: Used ERPs and the purchasing processes in the case unit

In the purchasing organization, there are 15 purchasers using more than one purchasing system as a part of normal work. The use of several purchasing system in parallel is causing confusion to some purchasers, but it is improving the flexibility to the unit's performance. For the performance measurement system this is causing inaccuracy and need for additional calculation for internal process measurements. Still the encountered inaccuracy is not affecting to the performance results, but requires manual calculation before sub performance results can be entered to performance measurement system.

Some purchasers are acting in several purchasing processes or purchasing areas and are using several purchasing applications. Also three purchasers are supporting foreign units especially with new capital expenditure projects; these processes are temporarily using other applications. These performance metric data has to be manually added to appropriate processes performance measurement results. All performance measurement areas and processes are presented in the Table 10 below.

Perspective	Process / area Measurement - Metric	System				Materials			Chemicals				Shipping
						AIE	MRO	Capex materials	Chemicals	Laboratory materials	Services		Shipping
Process	Purchase orders	M+	Repro	Amos	Other						Opex	Capex	
	AIE	X	X			M+ , Repro, Excel							
	MRO	X					M+						
	Chemicals	X							M+	M+			
	Services	X									M+		
	Capex Services		X									Repro	
	Capex Materials		X		X			x				Repro	
Process	Delivery Accuracy												
	AIE	X				M+							
	MRO	X					M+						
	Chemicals	X							M+	M+			
	Services	X										M+	
	Capex Materials		X					Repro				n/a	
	Shipping			X									Amos
Process	Efficiency												
	AIE	X	X			M+, Repro, Excel							
	MRO	X					M+,Repro						
	Chemicals	X							M+	M+			
	Services	X										M+	
	Capex		X		X			Repro				Repro	
	Shipping			X									Amos
Financial	Contracts usage												
	AIE	X				M+							
	MRO	X					M+						
	Chemicals	X							M+	M+			
	Services	X									M+		
	Capex Materials & Service		X					Repro				Repro	
	Shipping			X									n/a
Supplier	Suppliers, Stakeholders												
	Supplier feedback				X	x	x	x	x	x	x	x	x
	Safety performance actions				X	x	x	x	x	x	x	x	x
	Completion of Quality performance actions				X	x	x	x	x	x	x	x	x
	Completion of NCRs				X	x	x	x	x	x	x	x	x
	Progress sharing with stakeholders				X	x	x	x	x	x	x	x	x
Learning, Growth	Competences, Growth												
	Materials team				X	x	x	x					
	Chemical, services				X				x	x	x	x	
	Shipping team				X								x
	Improvement projects progress materials				X	x	x	x					
	Improvement projects progress services				X				x	x	x	x	
	Improvement projects progress shipping				X								x

Table 10: Purchasing performance measurement systems and processes

Financial performance measurement

The contracts usage is measuring how well a purchaser has used the signed frame agreements and typed agreement number into a correct place in a respective ERP-system. In the capital expenditure service contracts the frame agreement usage has improved during last years, the performance result is stable and the performance measurement result is reliable. On the material purchases the frame agreement usage has been improved after the starting measurement, but there are areas without any frame agreements. With purchasing areas missing frame agreements, the reliability of this performance measurement is weaker than anticipated.

The question is how the financial benefits are ensured, measured and performance improved for the purchases without any frame agreements? On practical point, there are several areas where frame agreements cannot be made or there is no financial benefit gained with the frame agreements. But the tested performance measuring system measured financial perspective performance reliably according enablers in the case company.

Internal business processes

Purchase orders

The purchase order is the final deliverable of a purchaser to a supplier reflecting completed amount of purchaser's work. During the test use several different projects were launched in the case company creating high work load. Also important maintenance project was started in foreign unit, in which the purchase orders was agreed to be executed in the case company. This work is additional for the purchasing process metric and results have to be added manually to performance metrics. Designed purchasing processes results were accurate, but setting of a good and realistic target value for amount of purchase orders is requiring stable process and good understanding of future investment projects.

Delivery accuracy

Maintenance related purchase orders delivery accuracy is the major part of the performance metric, but investment related deliveries are often more valuable. Sub metrics of the delivery accuracy is based on teams' performance for maintenance related deliveries. Investment related deliveries are calculated as an own sub metric. This metric is accurate, reliable and useful for performance measurement as designed, but the amount of manual calculation required for team based performance is high.

Efficiency

Working hours are payroll hours which include all working time, but not sick leaves and holidays. Report of working hours is reached one to two months later than measured month in order to reach the accurate working hours, because sick leaves is affecting afterwards to these figures. In the capital expenditure process, there are actions which are not visible in the calculation like cost estimation enquiries during basic engineering. These actions purchaser

has to execute, but the accordant purchase order is completed often several weeks later if project is eventually approved and execution started. These uncertainties are affecting inaccuracy in short perspective e.g. on monthly performance, but disturbance is not affecting much on longer period.

Competences & Growth

In the case company competence development improvement project was executed during the test use. Project's progress was monitored with this performance metric in teams. The performance metric is reliable and easy to use, but measuring only quantitative performance. The improvement projects' performance in teams is a proposal to establish and measure this performance on the monthly basis as a part of balanced performance measurement. Improvement actions, kaizens or any other own process improvement proposals performance measurement metric should be established to secure performance improvement. Still continuous improvement has to be initiated and be a part of normal work process prior establishing the performance measurement.

Suppliers & Stakeholders

In the case company establishing frequent feedback and communication between the suppliers and stakeholders is an essential action and is based on the strategy. This performance measurement is measuring only if the monthly target has been achieved. The quality and the results of communication are not measured, but might be measured after communication is established and is working well. Quality issues related to feedback and performance have to be established prior more accurate performance measurement.

Use of the performance measurement system

The performance measurement system is easy to use, but several ERPs and processes are requiring much working time for collecting the data. The operational performance is calculated for each purchaser and then summarized to team level. In the designed balanced performance measurement system, the reliability of data and metrics are most important. The reached accuracy is requiring quite much manual work and calculation from responsible managers.

7.2 Updated performance measurement system

The performance measurement system is updated during the test use according found results and encountered problems.

Purchase orders

Purchase orders	1	2	3	4	5	6	7	8	9	10	11	12	Target	Results Average	Average / Target %	New target min	New target	New max
AIE, M+ and Repro	100	114	128	192	156	166	163	146	144	177	167	120	192,5	147,8	76,8	100,0	147,8	192,0
M+ MRO materials	190	363	247	310	297	239	246	230	360	369	317	216	425,0	282,0	66,3	190,0	282,0	369,0
M+ Chemicals	209	267	217	212	270	212	231	195	234	273	207	220	278,9	228,9	82,1	195,0	228,9	273,0
M+ Services	63	91	84	67	51	78	57	55	71	82	79	51	133,4	69,1	51,8	51,0	69,1	91,0
Repro capex services	80	102	76	211	68	113	51	69	87	126	105	82	135,8	97,5	71,8	51,0	97,5	211,0
Repro capex Materials	58	92	40	101	30	24	35	17	23	41	38	19	200,2	43,2	21,6	17,0	43,2	101,0

Table 11: The evaluation of the test results from the purchase orders amount in 2013

The amount of purchase orders results deviated from the targets based on the year 2012 performance results. The performance measurement results were compared to the targets of the respective processes or areas. In the Table 11 above can be seen, that the targets were not reached and in average only 61, 7 % of the targets were reached. Still all of the required purchase order requests have been done, which is meaning that demand has decreased in 2013. The biggest deviation was on the Repro capex materials, which amount of the completed purchase order was 21, 6 % of the target.

One explanation is that the purchase orders are not needed as there are no new execution projects on-going as investment decision and approval process have changed. During the test period, there have been several projects waiting for the approval. The targets for purchase orders in different areas were recalculated based on the test use results.

New scale of Purchase orders	0	1	2	3	4	5	6	7	8	9	10
AIE, M+ and Repro	100,0	109,6	119,1	128,7	138,2	147,8	156,7	165,7	174,6	183,6	192,5
M+ MRO materials	190,0	208,4	226,8	245,2	263,6	282,0	310,6	339,2	367,8	396,4	425,0
M+ Chemicals	195,0	201,8	208,6	215,4	222,1	228,9	238,9	248,9	258,9	268,9	278,9
M+ Services	51,0	54,6	58,2	61,9	65,5	69,1	81,9	94,8	107,7	120,5	133,4
Repro capex services	51,0	60,3	69,6	78,9	88,2	97,5	120,2	142,9	165,6	188,3	211,0
Repro capex Materials	17,0	22,2	27,5	32,7	37,9	43,2	74,6	106,0	137,4	168,8	200,2

Table 12: The new scale of purchase orders in the measurement areas

The new targets were calculated in the Table 12 by setting average test results to scale of 5 and reached minimum and maximum values to 0 and 10. The scale is set by linear calculation between the target and the minimum or the maximum value.

Delivery accuracy	1	2	3	4	5	6	7	8	9	10	11	12	Target	Results Average	Average / Target %	New target min	New target	New max
AIE M+	91	92	99,12	72,86	77,52	93,9	83,4	93	93,5	97,2	95,6	93	88	90,2	102,5	72,9	90,2	99,1
MRO M+	79	91	93,6	93,8	85,21	85,7	77,9	82,5	94,6	93,4	93,1	88,3	88	88,2	100,2	77,9	88,2	94,6
Chemicals M+	79	90	94,52	91,1	92,49	85,2	90,1	91,1	93,4	95,3	96,4	92,2	88	90,9	103,3	79,0	90,9	96,4
Service M+	27	37	40,65	46,3	30,26	37,6	47,1	53,3	49,3	36,9	42,2	26,4	88	39,5	44,9	26,4	39,5	53,3
Capex, Repro Materials	78	58	60,32	58,49	69,44	89,9	91,1	85,8	87,2	86,83	79,34	91,2	88	78,0	88,6	58,0	78,0	91,2
Shipping	79,1	88,2	88,2	87	86	84	81	86	92	91	93	88	88	87,0	98,8	79,1	87,0	93,0

Table 13: The delivery accuracy test results and proposed new targets for the metric

The delivery accuracy was reached well in average during the test use period. Major deviation was noticed with Service M+ results, which is presented in Table 13. Information of received services and agreed delivery time is partly not reliable in the ERP-systems, but still this performance measurement is valid to all purchase orders. As the delivery accuracy is one of the major KPI for the case company, new targets was not taken into use.

Efficiency	1	2	3	4	5	6	7	8	9	10	11	12	Target	Results Average	Average / Target %	New target min	New target	New target max
AIE hours /PO M+& repro	4,1	4,1	3,26	2,24	3,24	3,6	3,2	4,4	3,3	3,2	2,9	3,4	4,4	3,4	77,6	2,2	3,4	4,4
MRO hours /PO M+	4,2	4,2	3,9	3,41	3,74	4,1	3,6	5,1	3,3	3,8	4,1	4,9	4,5	4,0	89,3	3,3	4,0	5,1
Chemicals hours / PO M+	2,1	2,1	2,45	1,7	1,59	2,3	2,2	3,8	2,4	2,2	2,9	2	2,3	2,3	101,6	1,6	2,3	3,8
Services Hours / PO M+	5,2	5,2	3,93	1,57	7,03	5,4	7,8	8,3	2,5	3	1,9	2,4	5,6	4,5	80,3	1,6	4,5	8,3
Capex hours / PO repro	8,75	8,75	5,54	3,72	8,29	7,6	8,9	11,9	10	7,7	8,7	11	9,5	8,4	88,7	3,7	8,4	11,9
Shipping hours / PO Amos	1,7	1,6	1,7	1,35	1,23	1,48	2,02	1,59	1,4	1,47	1,63	1,44	1,8	1,6	88,4	1,2	1,6	2,0

Table 14: Recalculation of the efficiency performance metric

Efficiency target was reached by 87,7 % during the test period on average as seen in Table 14 above. Major difference between reached and targeted figures was realized with the efficiency of the AIE-category purchasers of 77,6 %. The service purchasers worked with 80,3 % efficiency ratio. New targets were calculated by the result of 2013 and set with linear interpolation between minimum as 0, set targets with scale of 5 and new maximum values placed for scale of 10 in Table 15 below.

New scale of Efficiency	0	1	2	3	4	5	6	7	8	9	10
AIE hours /PO M+& repro	2,2	2,5	2,7	2,9	3,2	3,4	3,8	4,1	4,8	5,5	6,1
MRO hours /PO M+	3,3	3,4	3,6	3,7	3,9	4,0	4,4	4,8	5,6	6,4	7,3
Chemicals hours / PO M+	1,6	1,7	1,9	2,0	2,2	2,3	2,5	2,8	3,2	3,7	4,2
Services Hours / PO M+	1,6	2,2	2,7	3,3	3,9	4,5	5,0	5,4	6,3	7,2	8,1
Capex hours / PO repro	3,7	4,7	5,6	6,5	7,5	8,4	9,2	10,1	11,8	13,4	15,1
Shipping hours / PO Amos	1,2	1,3	1,4	1,4	1,5	1,6	1,7	1,9	2,2	2,5	2,8

Table 15: New target values for the efficiency performance metric

In the SAKE-performance measurement system priority rank of negative and positive values can be set in both directions. The ranking order can be set in upwards or downwards independently for each of the six performance metrics. In this scale good performance is set for 0 and poor performance as 10. After quick test, this scale is changed to opposite direction

and AIE performance scale of 0 value was set as 6,1. Target value for scale of 5 was set as 3,4 and scale value of 10 was set as 2,2 hours per purchase orders.

Contracts usage	1	2	3	4	5	6	7	8	9	10	11	12	Target	Results Average	Average / Target %	New target min	New target	New target max
AIE M+ contracts usage	5,1	34,7	2,18	0	0	1,66	0,39	3,52	0	1,17	3,41	1,23	35,0	4,4	12,7	0,0	4,4	34,7
MRO M+ materials	20,9	34	17,98	16,67	18,06	27,14	20,8	19,81	20,99	21,42	24,46	19,77	35,0	21,8	62,4	16,7	21,8	34,0
Chemical M+	30,4	6	27,6	28,3	29,37	42,74	31,8	28,5	39,79	45,54	50,82	32,24	35,0	32,8	93,6	6,0	32,8	50,8
Service M+	0	40,8	0	0	0	0	0	0	0	0	0	0	35,0	3,4	9,7	0,0	3,4	40,8
Repro Mat + Service	46,4	54,8	43,31	46,41	40,49	58,74	33,33	49,49	52,94	51,38	60,16	55,17	35,0	49,4	141,1	33,3	49,4	60,2
Shipping usage	30	30	30	30	10	0	0	0	0	0	0	0	35,0	10,8	31,0	0,0	10,8	30,0

Table 16: The results of the contract usage metric

Contract usage results of the test period were reached by 58,4 % in average as seen in Table 16. Most differences can be seen for Repro Mat + Service - purchase orders which contract usage has been above target with 141 %. Also the AIE -sub metric's result with 12,7 % and Service M+ with 9,7 % was remarkable deviation compared to target figures, which were based on 2012 performance and estimation. Shipping sub metric's reached value of contracts usage is only estimation as Amos ERP -data is not available. Despite of this missing data, the target value has been calculated again in order to focus purchasers' thinking to gather all suitable purchases under existing frame agreements increasing purchasing power. New targets were calculated with the same principles in the Table 17 as other perspectives.

Contracts usage	0	1	2	3	4	5	6	7	8	9	10
AIE M+ contracts usage	0,0	0,9	1,8	2,7	3,6	4,4	10,6	16,7	22,8	28,9	35,0
MRO M+ materials	16,7	17,7	18,7	19,8	20,8	21,8	29,9	38,1	46,2	54,3	62,4
Chemical M+	6,0	11,4	16,7	22,1	27,4	32,8	44,9	57,1	69,3	81,4	93,6
Service M+	0,0	0,7	1,4	2,0	2,7	3,4	10,9	18,4	25,8	33,3	40,8
Repro Mat + Service	33,3	36,7	40,0	43,3	46,7	50,0	55,0	60,0	67,0	75,0	90,0
Shipping usage	0,0	2,2	4,3	6,5	8,7	10,8	15,7	20,5	25,3	30,2	35,0

Table 17: The recalculated targets of the financial performance metric

7.3 Final findings

The Sake performance measurement system is easy to implement to the purchasing performance measurement purposes and also it is easy to use. The purchasing performance is reliably measured for efficiency and delivery accuracy, but several ERP-systems are decreasing accuracy and require quite much manual calculation and additional work. Therefore updating and calculation of the monthly performance is requiring perhaps too much

effort. The performance measurement system for several ERP-systems and flexible moving from one measurement area to another area is decreasing the accuracy of the performance measurement system. On the same time the calculation of the performance measurement values are more complicated and are requiring more effort.

The balanced performance measurement system is suitable to measure reliably the performance of the purchasing process. The performance measures of the process efficiency, the delivery accuracy and the competence development are suitable performance measures for any kind of processes. The frame agreements usage is the only performance measure presenting the financial impact of the purchasing process and especially in the case unit. The financial performance of the company is followed up with another performance monitoring calculation and purchasing process is more or less transactional performance measurement. In the case company, implementation of the strategic sourcing has recently been done and the financial performance is measured by the results of the sourcing projects completing to frame agreements. Thus in the case company, purchasing is seen more as an operative process than value producing process and the performance measurement system is adapted according to this.

8 CONCLUSIONS

8.1 Targets and execution of the study

Target of the study was to design balanced performance measurement system which is suitable to a purchasing process. Designed performance measurement system is tested in purchasing process and improved during the test period in the case company. Also aim was to define most suitable performance measurement system to purchasing process handling various types of goods and services with high demand variations.

Literature was reviewed in order to find theoretical basis in measuring performance of purchasing process with balanced principle. The purchasing processes were studied in the case company and suitable performance metrics presented and selected. The Balanced Scorecard of Kaplan and Norton (1996, p. 9), was the basis for designed purchasing performance measurement system. SAKE - performance measurement application was used for the design, implementation and test use; performance measurement design is presented in Appendix 1 and results in Appendix 2 and 3. The performance measurement system was tested in the case company and performance measurement system was updated according reached results and revealed problems during the test. The balanced performance measurement model was chosen and performance measurement system designed and adjusted to purchasing process in the case company.

The designed performance measurement system was improved during the test use, the model was found useful for the performance measurement of the purchasing process. The performance measures and perspectives were adjusted to suit to the purchasing processes in the case company. In the test use, theoretical framework and practical enablers were composed together and the performance measurement system updated to reach the goal. Challenges were encountered with environment especially with the multiple ERP-systems used in purchasing processes and overall flexibility in purchasers' working along with different processes.

The designed performance measurement system is measuring the purchasing process performance with purchase orders, delivery accuracy and efficiency. Financial perspective is measured with the ratio of purchase orders done according to the frame agreement. This

performance metric is measured covering each process areas. The financial performance metric is concluded from the case unit's strategy and is consequence of sourcing activities in the case company. Trouble is that the measured performance values are fluctuating a lot between different months or measured processes or process areas. In the Suppliers & Stakeholders perspective, the case unit´s performance measurement system is measuring frequent discussions with suppliers and stakeholders. This measurement is ensuring that communication is frequent and fruitful with suppliers and internal participants. Safety performance actions and quality improvement actions are reflecting the progress with these strategic and important issues in the case company, and therefore selected to performance metrics. The performance measurement of the competences and growth perspective is measuring team based the ratio of completed competence improvement actions. The key performance indicators for measuring the purchasing performance was selected with internal business processes-, financial-, suppliers & stakeholders- and competences & growth - perspectives, performance metrics definitions and results are presented in Appendix 3. This performance measurement is reflecting the real performance, but more suitable metrics may be needed for future performance measurement.

8.2 Results and evaluation of the study

Internal business process performance is measured in the case by amount of purchase orders, Delivery accuracy and operational efficiency. Purchase orders amount is reflecting demand of the stakeholders and progress of previous actions. Therefore target setting is difficult in fair way to present the performance of purchasing process. Purchase orders amount is reflecting the output from this process. Delivery accuracy and operational efficiency is reflecting the performance of the purchasing process.

The performance measurement of suppliers & stakeholders perspective is based on the literature findings and proposals from the case company. The designed performance metrics is suitable for well- established processes. In the case company, feedback metric was not reflecting well real performance, because the performed actions have wide range of different type of actions with different suppliers and stakeholders and metric should be more precise and qualitative in nature. Still this performance perspective is guiding future tasks along with

strategy and better result may be obtained in the future with more precise performance metrics.

Learning and growth perspective's performance is measured with competences, growth metrics, which were competence development participation and development actions. Competence development actions are reflecting well the progress of agreed competence development actions in the case company. Development actions are based on literature proposals and it was not fitting well to performance measurement in the case company. Poor performance of this metric is mainly consequence of unsettled work on this perspective in the case company and the performance metric may be useful in other circumstances or companies.Some performance metrics e.g. Stakeholders & Suppliers -perspective performance measurement is based on quantitative performance measurement. Quantitative measurement is natural starting point for a measurement of a new process, but further development for a qualitative performance measurement is proposed. In the purchasing process of the case company, there are many slightly different versions of the purchasing process for different use e.g. purchasing of capital expenditure versus operational expenditure or materials versus services. As well the various information systems are making performance measurement more complex. Also several ERPs are requiring additional analysis of the captured data. These variations are detrimental to accurate performance measurement.

Based on the results obtained from the test in the case company, the purchasing process performance is measurable with balanced performance measurement principle. In the case-company the financial perspective's savings are calculated as part of the sourcing operations and they are not addressed in the purchasing process. The balanced scorecard is well suited for the measurement of the purchasing process. The balanced performance measurement system can be used to guide the company's activities according to corporate strategy as seen in the test case. SAKE - performance measurement application suits fine to performance measurement in small and mid-size enterprises and also to initiate a new performance measurement in all kind of companies. SAKE - application is easy to implement, use and modify with several independent parameters. This is enabling to use several different types of metrics and results are amalgamated into one performance figure describing the united performance of all metrics.

The SAKE performance measurement system presented some faulty results in the efficiency performance measurement with calculated decimal figures. The problem existed randomly with decimal figures and it was skipped by calculating achieved values to integers. Main issue is that all results have to be checked before approving performance measurement system in use.

The target of this study was to reveal and answer the following three questions:

1. How purchasing process performance can be measured with balanced views?

The purchasing process performance can be measured reliably with the balanced Scorecard principle as realized with the test in the case company. The balanced Scorecard´s perspectives were used in the test case and performance measurement system is measuring the performance according targets set in company strategy.

2. What is the most suitable performance measurement system to purchasing process handling various types of goods and services?

In the literature several performance measurement systems were revealed. In the case company, the designed SAKE-balanced performance measurement system was taken into use mainly because of SAKE-application's easy implementation and flexibility with several independent parameters. Kaplan and Norton's (1996, p.9) the Balanced Scorecard was on the basis of the designed purchasing performance measurement system. Several adjustments were done to match theoretical framework and existing environment to reliable performance measurement system. For the case company, the updated performance measuring system is the most suitable purchasing process performance measurement system, but it is also, like many others, requiring continues development.

3. How performance measurement system can be scaled to present relevant progress and trend?

Setting targets and monitoring progress is challenging if previous performance is obscure and performance measurement system is not easy to be rescaled. In the test case, it was realized that in new organizations or processes, scaling of targets is requiring flexibility from the performance measurement system in order to adapt high variations. With the SAKE - application performance targets and metrics was easy to adapt. Still high variations are

requiring additional analysis and previous performance values have to be filled into updated to the performance measurement system. SAKE -application is presenting progress with charts as presented in Appendix 2 and 3. Therefore SAKE with designed and updated performance measurement system is a good answer to this question.

8.3 Proposals for additional research

Additional research is proposed for measuring financial performance and financial benefits. In was noticed in the case company, that financial benefits of one time valuable investment purchase orders, so called spot buy - purchase orders, financial performance calculation and performance measuring is a desired area for additional research.

In the case company, competence development was included to the performance measurement system. Competence development is requiring systematic performance and progress monitoring; at least in the case company, the competence development performance was peaked as it was included to short time incentive and progress monitored monthly. So, further research of the evaluation of competences and competence performance measurement may be beneficial.

The stakeholder and supplier communication frequency is set as performance metrics in this study. The qualitative and quantitative issues in communication with suppliers and stakeholders might be beneficial area for additional research. In the study, only quantitative performance was measured and additional research for sufficient qualitative information sharing between supplier and buyer might be worthwhile.

9 SUMMARY

In the study, most suitable performance measurement systems and design methods were revealed from the literature. The purchasing process and suitable performance metrics for purchasing process was studied and Kaplan and Norton's (1996, p.9) the Balanced Scorecard based performance measurement system designed, implemented and test used in the case company.

Performance measuring system was designed and tested in the case company with performance measurement system created with SAKE- application. The purchasing process in the case company is standardized, but there are still some deviations between material and service purchases. Also capital and operational expenditure purchases have some minor differences in process, but also different computer system. Several computer systems and flexible working on different purchasing processes have negative impact on the reliability of the internal business process perspective's performance results as achieved performance figures have to be calculated and combined from several data sources.

Test use in the case company presented minor errors in the designed performance system. Especially target figures were forced to re-estimate as e.g. demand of capital expenditure purchases temporarily increased remarkably. Also the financial performance measurement target values and metrics were updated to meet changed environment. Therefore easy scaling of target values or performance metrics is essential feature in the performance measurement system. During the test use minor calculation error was found in the SAKE - MS Excel sheet. The problem might be based on the use of comma with English or Finnish language versions. Still most important lesson is, that all results have to be check and approved before starting to use. Metrics cards were established for each performance metrics and found important basis for design and in the use of performance measurement system.

The findings of the study emphasize importance of the performance measurement with balanced perspectives. Actions and performance of the company is led according to company strategy and progress monitored regularly. With the SAKE-performance measurement application a complex process performance can be measured reliably and with moderate resource requirements in the balanced way. The purchasing process performance was

measured with the chosen balanced perspectives metrics reflecting holistic and reasonably accurate view of the real performance.

According the results of this study, performance measurement system is recommended to define and implement on the balanced perspectives with linkage to the strategy of a company. The SAKE-application is easy to use which may shorten time needed in the performance measurement planning-phase. Also flexibility to change parameters of the performance measurement system is important for future needs.

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APPENDIX 1 Purchasing PMS system in the case company

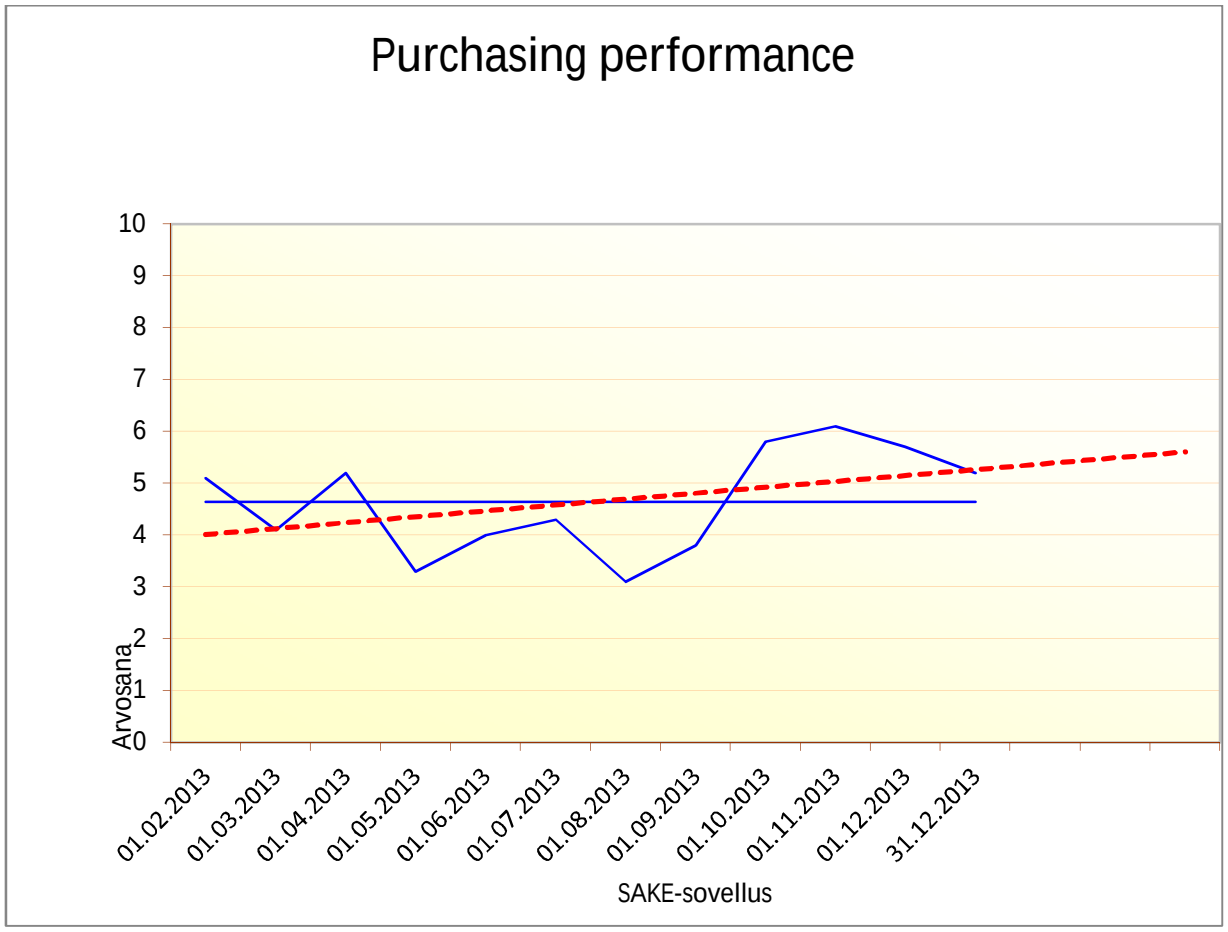
PÄÄTAULUKKO

OSA-ALUE	TULOS	TAVOITE	ARVOSANA	PAINO
Purchase orders - Process	1,5	10	1	20 %
Delivery Accuracy - Process	9,5	10	9	20 %
Efficiency - Process	6,5	10	6	20 %
Contracts usage - Financial	3,5	10	3	20 %
Suppliers & Stakeholders	5,0	10	5	10 %
Competences, Growth	9,3	10	9	10 %
			YRITYKSEN SUORITUSKYKY	5,2

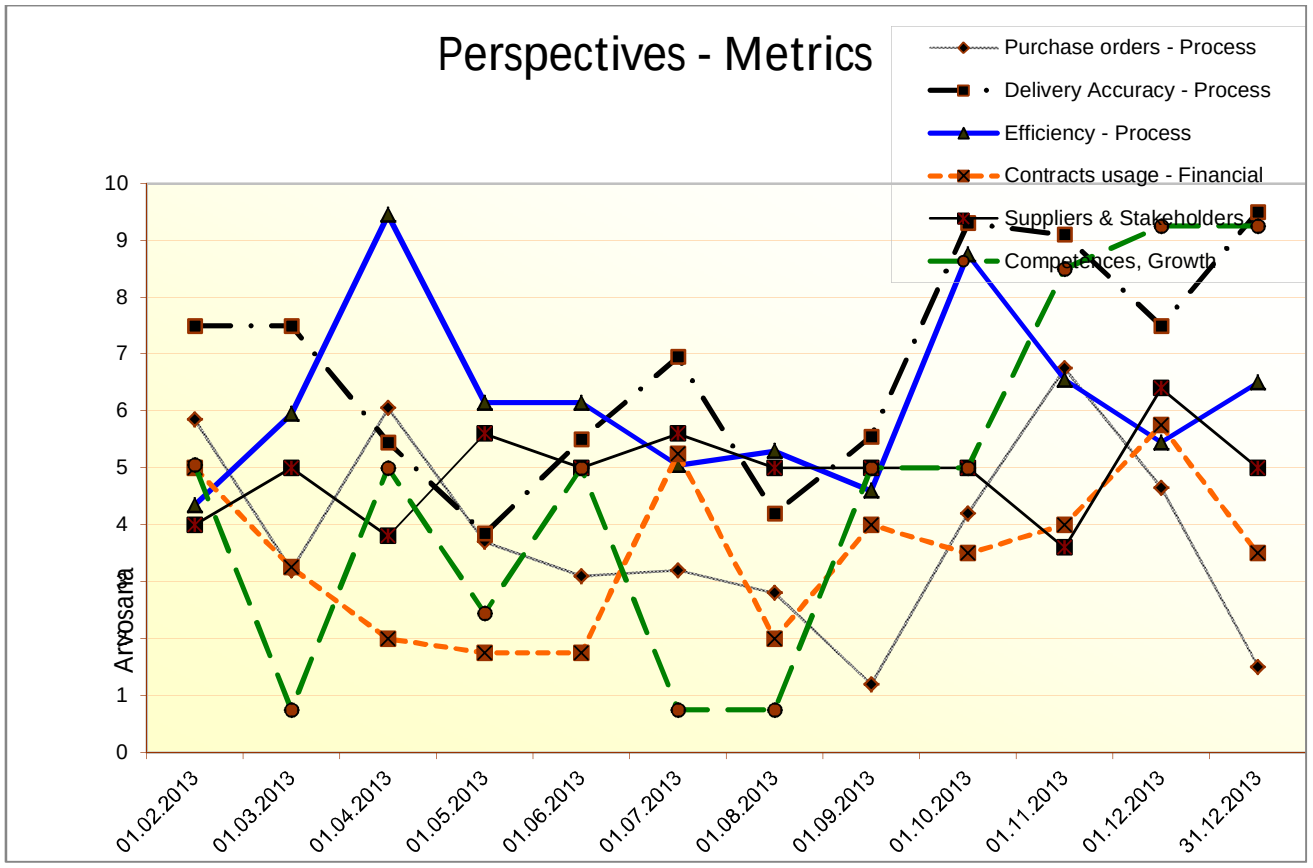
OSA-ALUEIDEN SELITYKSET	Purchase orders - Process	Delivery Accuracy - Process	Efficiency - Process	Contracts usage - Financial	Suppliers & Stakeholders	Competences, Growth
	Amount of purchase orders in each process or team area	*Delivered purchase order rows in time vs. all order lines.*	*Used hours per purchase order in process area or team.*	*Ratio of purchase orders done based on frame agreements.*	*Ratio of shared actions with suppliers and stakeholders.*	*Ratio of completed competence development and other development actions in teams.*

SUORITUSKYVYN OSA-ALUE	Purchase orders - Process	Delivery Accuracy - Process	Efficiency - Process	Contracts usage - Financia	Suppliers & Stakeholders	Competences, Growth
KAUDEN TULOS	1,5	9,5	6,5	3,5	5,0	9,3
Taso 10	10	10	10	10	10	10
Taso 9	9	9	9	9	9	9
Taso 8	8	8	8	8	8	8
Taso 7	7	7	7	7	7	7
Taso 6	6	6	6	6	6	6
Taso 5	5	5	5	5	5	5
Taso 4	4	4	4	4	4	4
Taso 3	3	3	3	3	3	3
Taso 2	2	2	2	2	2	2
Taso 1	1	1	1	1	1	1
Taso 0	0	0	0	0	0	0
ARVOSANA	1	9	6	3	5	9

APPENDIX 2 Chart of Purchasing performance results



APPENDIX 3: Chart of Purchasing Performance - Perspectives' and metrics'



Appendix 4 The list of suitable performance metrics for the purchasing process

Description	Formula	Source of data	Relattion to strategy	Materials opex	Materials capex	Services opex	Services capex	Shipping	interval	Target value	UoM	Conclusions / effective parameter
Average lead time for purchases to get the requisition converted to PO and sent to supplier	Sum of (Date when PO was sent to supplier – date when PR was created) / Sum of POs		yes	yes	yes	yes	yes	yes	month	3 days	Days	
Average lead time from requisition to RFQ	Time between request approved to RFQ created and send to supplier	M+, Repro, Amos	yes	yes	yes	yes	yes	yes	month	5 days		
Average lead time from requisition to PO	Time between request to PO created and sent to supplier	M+, Repro, Amos	yes	yes	yes	yes	yes	yes	month	3 days		
Share of purchasing actions done in agreed time span	Number of purchasing actions done in agreed time span divided by all actions	tbd	yes	yes	yes	yes	yes	yes	month	100 %		
Average lead time for purchases to get the RFQ processed, and PO created and sent to supplier	Sum of (Date when PO was sent to supplier – date when RFQ was created) / Sum of POs	M+, Repro, Amos	yes	yes	yes	yes	yes	yes	month		Days	
Amount of requests ordered later than request date	Number of requests not ordered until the request date	M+, Repro, Amos	yes	yes	yes	yes	yes	no	no			
Amount of requests delivered later than request date	Number of purchase orders delivered later than request date	M+, Repro, Amos	yes	yes	yes	yes	no	yes	month			
Delivery accuracy	On time delivery lines / all delivered lines	M+, Repro, Amos	yes	yes	yes	yes	no	yes	month	100		
% of orders delivered in full quantity on the last confirmed delivery date	Orders delivered in full quantity with last confirmed delivery date – actual delivery date ≥ 0		yes	yes	yes	no	no	yes	month	100	Days	
Number of open order lines and RFQ lines per purchaser	Sum of open order lines per purchaser		yes	yes	yes	yes	yes	yes	month	6000	#	
Number of non archieved (=completed) Pos	Number of open Pos on going		yes	yes	yes	yes	yes	yes	month	tbd		
Numer of deleted and cancelled Pos	Number of cancelled Pos in system per purchaser		yes	yes	yes	yes	yes	yes	1/Q	0		
Internal quality index	Results of monthly quality audits	excel	yes	yes	yes	yes	yes	yes	month	100 %		
Frame contracts usage share of all	Value of frame agreements in FP's	Repro, M+, Amos?	yes	yes	yes	yes	yes	?	month	100 %		
Capacity usage	Availabe resources x top performance capacity	excel	yes	yes	yes	yes	yes	yes	month	80 %		
Spend and number of order lines and RFQ lines processed by purchaser	Sum of order lines and RFQ processed per purchaser and the spend of the order lines and RFQ lines	Repro, M+, Amos	yes								#	
Used work hours /purchase orderline	Working hours used divided by purcheser's purchase order	Payrol/ repro + M+	yes	yes	yes	yes	yes	yes	month	10		
Used work hours /purchase orderline	Working hours used divided by purcheser's purchase order lines	m+	yes	yes		yes		yes	month	1		
Cost of purchase order	Costs of purchases r divided by number of Pos											
Share of value added purchases	Share of ordered lines value above purchase costs											
# of RFQs created for spot buys < x €	Count of RFQs with value < x €										#	
Contractors safety performance	TRIF		yes	no	no	yes	yes	no	quatile	0		
Supplier management	Number of meetings and actions completed divided by all ones		yes	yes	yes	yes	yes	yes	annual	100 %		
Safety improvement actions	Ratio of completed actions of all planned actions per month		yes	yes	yes	yes	yes	yes	month	100 %		
Supplier management	Number of send delivery accuracy and reclamation status reports divided by chesen suppliers		yes	yes	yes	yes	yes	yes	quartile	100 %		
Employee retention	Amount of left purchasers divided with total amount of purchasers		yes	yes	yes	yes	yes	yes	quartile	100 %		
Competence development actions done	Completed team actions in time divided with target amount of actions		yes	yes	yes	yes	yes	yes	month	100 %		
Personal development discussions done as planned									annual			
Number of innovation ideas presented		new system needed	no									
Leadership index	leadership survey results from consulting company		yes	yes	yes	yes	yes	yes	1/year	x,xx index		
Number of reclamations and claims handled per purchaser	Count of reclamations and claims per purchaser	Portal	no	yes	yes	yes	yes	yes	quatile		#	
Savings generated through efficient use of term contracts	TBD – requires further discussion and analysis										€	
Savings generated through RFQ for spot buys per purchaser	TBD – requires further discussion and analysis										€	
Number and % of incorrect orders created by purchasers (e.g. wrong item ordered)	Sum of incorrect purchase order lines / total number of purchase order lines										#, %	
Stakeholder satisfaction survey	Open questionnaire sent to stakeholders										rating	