AALBORG UNIVERSITY

Procurement optimisation based on balanced scorecard.

Implementation guidelines for pharmaceutical industry

Master Thesis

International Business Economics

Egle Juzokaitė

Lina Trainavičiūtė

31st of August, 2009

Aalborg University
International Business Economics
M.Sc. in International Business

Name of the Master Thesis:
Procurement optimisation based on balanced scorecard. Implementation guidelines for pharmaceutical industry.

Submission date: 31st of August, 2009

Supervisor: John Kuada

Pages: 143

Authors: Eglė Juzokaitė
Lina Trainavičiūtė

Abstract

This Master thesis aims at directing European pharmaceutical manufacturing companies towards gaining financial benefits through optimisation of production material procurement performance. This is done by employing the principles of balanced scorecard method and building a framework for procurement function performance measurement, where the most important success factors, objectives and measures are indicated and grouped according to five different perspectives tied among themselves with synergetic relations. Hypotheses are formulated according to the characteristics and trends of pharmaceutical industry. While using the hypotheses we want to investigate which objectives and success factors are the most crucial for procurement success. We test the hypotheses empirically with a pilot survey and come to the conclusions that the most important factor that should be optimised is material quality, while this is the most probable to achieve if a supplier has implemented quality management system. Additionally, supplier relationship management is crucial determinant of production material procurement, thus it is another aspect that should receive largest attention in procurement performance optimisation. The most significant tool for supplier relationship management is long-term relationship.

Table of Contents

1. Introduction

Currently evolving tendency, noticed in various companies is the development of the approach towards purchasing function from a purely operational function to a strategic item of the company, significantly contributing to the overall success of a company. In addition, a value of strategic procurement has been recognised by academics. (e.g. Cox, 1996, Anderson, 1998, Chen et.al., 2004, Kerkhoff , 2005, Dimitri et al. 2006). Their interest in various aspects of procurement is increasing and new innovative solutions are searched in order to create more competitive advantages through procurement function. The benefits that can be gained from strategic procurement are significant – from improved financial situation of the company to contribution to R&D and manufacturing processes optimisation (Kerkhoff, 2005).

Although performance optimisation of procurement has been broadly discussed (e.g., Dyer et al. 1998, , Vonderembse, 1999, Boer, 2001, Farmer and Van Weele, 1995, Van Weele 2002, Kerkhoff, 2005, Van Weele, 2005, Dimitri et al. 2006, Berger, 2006, Baily, 2008, Buchanan, 2008 and many others), a field of performance measurement in procurement, which is surely not less important as the actual optimisation, has been discussed in the academic world only briefly. It must be noted that performance measurement is essential, as it provides guidance for optimisation strategy development and builds a foundation for benchmarking opportunities as well. Thus, this Master thesis attempts to address the gap of theoretical discussion of purchasing in performance measurement context.

Balanced scorecard (BSC) is a framework for implementation of performance measurement system, which has significant advantages over other performance measurement frameworks due to its broad applicability and flexibility (Dixon 1990, Kaplan and Norton, 1992, Maskel, 1992, Kaplan and Norton 1996, Beathem et. al. 2004). Thus, we believe that BSC should be a suitable framework for analysis of purchasing performance. Some issues were noticed when companies have attempted to apply BSC for performance measurement in their procurement departments. One of the main issues, brought up by Wagner & Kaufmann (2004) was that companies were facing difficulties in understanding the procurement system as well as drivers of procurement performance.

Therefore, this issue is analysed in our Master thesis in order to provide guidelines for extended understanding of procurement system and facilitated procurement optimisation.

Moreover, our methodological systems approach guides us in all aspects of the research and as well significantly contributes to definition of the main research questions, as we are researching various aspects of procurement system and relations between them.

Consequently, throughout our master thesis, we are trying to answer these questions:

- Which factors can be named as procurement success factors, objectives and what are relevant performance measures? What are the variables, moderating them? What are relationships existing in the procurement system?

- How can the most important areas of procurement be optimized? What optimisation tools and methodologies and targets should be used?

- Are the provided theoretical assumptions valid in practical business, particularly in pharmaceutical industry? What are the most important procurement success factors and procurement performance measures and optimisation tools in regard to production material procurement performance optimisation in pharmaceutical manufacturing companies?

The research is guided by the questions, mentioned above. Firstly, we review relevant theoretical background in the fields of procurement and performance measurement. Due to the complexity of procurement as a system we believe that a theoretical framework in necessary in order to facilitate the understanding. We chose balanced scorecard as it both creates a required research framework, however also enables us to contribute to purchasing performance measurement field. Also, we discuss the relationship between different perspectives of procurement performance as well as importance of these perspectives. Then, we conclude the theoretical part of the master thesis by presentation of the procurement measurement model, which summarizes the theoretical discussion and is based on the antecedent-consequence logic. The model consists of several aspects – procurement success factors, procurement strategic objectives and relevant key performance indicators, as well as relationships between them. Moreover, the model includes moderating variables, which, we assume (justification in section 5.2. Moderating variables), affect the nature of the relationships between the different aspects of the model.

After presenting the theoretical model, we are aiming at investigating the application of the model for practical purposes. As one of the most important moderating procurement measurement model variables is identified to be an industry and we chose this moderating variable as a limitation for our empirical research. Purchasing in pharmaceutical industry can be defined as highly complex process, thus the application of the model for pharmaceutical industry can be predicted to be challenging. Moreover, the pharmaceutical manufacturers are facing constantly increasing competitive challenges, as well as market and legislative pressures, thus procurement optimisation can be highly beneficial in this industry in order to gain significant competitive advantages. Therefore, the procurement measurement model is tested among European pharmaceutical manufacturing companies. Additionally, procurement of only one group of materials is being tested, i.e. raw material and production goods. We believe that the procurement of this group of materials can make significant influence on overall performance of pharmaceutical manufacturing company.

Particularly, we are aiming at testing our hypotheses about supplier perspective as the main procurement performance driver, thus we investigate its most important success factor, its indicator and tools for optimizing procurement in pharmaceutical industry. We use quantitative research method for the empirical analysis, particularly a questionnaire, distributed among pharmaceutical manufacturers in Europe. The target of the questionnaire is creating a pilot survey, identifying suitable guidelines for further research. Afterwards, we are analyzing the gathered data by using several statistical tests in order to ensure the validity of our findings. Further we discuss and interpret our findings in both theoretical and practical context, and create guiding principles for procurement optimisation in pharmaceutical industry. Moreover, we provide guidelines for further research due to the pilot survey target, chosen for the empirical research.

2. Problem Formulation

Companies are starting to understand the importance of procurement as a strategic function of the organization – this tendency can be seen both in the business world and the increasing amount of academic articles, investigating the procurement field. As the competition is increasing, different ways of creating competitive advantages are being researched, evaluated and implemented. In the case of supply chain and particularly procurement, the benefits of optimisation are mostly clear - Kerkhoff (2005) notices that the financial situation of the company can be improved through the procurement function by locating and exploiting the potential for increased profit and reduced procurement expenditures. Moreover, the way managers design the procurement has a major effect on company's performance in both short and long run (Dimitri et al., 2006). However, although procurement is gaining more and more important role, some significant issues still remain unsolved.

Whilst emphasis has been on the need to improve quality, shorten delivery times and foster innovation in controlling purchases and making a contribution to corporate performance, the importance of cost and price cannot be neglected.

(Farmer & Van Weele, 1995)

Although the issue of finding the balance between quality and costs in procurement was discussed already in the 90s (Farmer & Van Weele, 1995), the search for optimised solutions is still continuing, despite significant progress and substantial achievements in this field.

Performance optimisation

Given the fact that the strategic importance of procurement has been emphasized and proven, initiatives for optimisation of procurement are undoubtedly relevant. The broad range of academic literature on different topics of improvements in procurement are available, including optimised supplier relationship management (Dyer et al., 1998, Kotabe et al., 2003), lean procurement (Wincel, 2003) and Total Quality Management (TQM) (Matthews, 2006, Chang, 2009) in procurement activities. Moreover, the benefits of

evaluating and benchmarking performance in the procurement field have also been significantly recognized as a tool for guiding procurement optimisation (Lau et al, 2006).

The primary step for procurement optimisation is collecting specific business data, which summarizes the performance of different aspects of procurement. When the performance data is collected and evaluated, performance gaps, performance shortfalls, even performance advantages can be identified (Neely, 1999). This data is as well used for benchmarking purposes. Thus procurement performance measurement can be considered as the foundation for successful optimisation practices, as, if successfully implemented, the performance measurement system guides the direction of optimisation, based on the past results.

Historically, the performance measurement systems were based on the management accounting systems, which were primarily based on the financial performance results of the company. (Otley, 1999) They were based on the approach, developed by Anthony (1965), when management control, strategic planning and operational control were targeted to be distinguished. However, Anthony (1965) neglected operational control and strategic planning as too complex questions and focused mainly on management control. However, the importance of more sophisticated approaches, taking into consideration the other dimensions, was clear. The balanced scorecard (BSC) framework, introduced by Kaplan & Norton (1992), was an attempt to integrate all dimensions, having high importance for the management of performance. Due to this and other significant advantages, extensively described in the following chapters, balanced scorecard is one of the best available approaches providing the overview of the strategy of a company or a business unit. Thus, we are expecting the balanced scorecard to be a relevant framework for researching strategic procurement and its performance drivers as well as foundation for providing procurement optimisation guidelines. However, at the same time we are going to investigate in our thesis, *if the BSC presents the full overview of the procurement strategy of the company, and if there are any important factors, having significant strategic importance for procurement, which are not presented in the performance measurement system*.

The choice of the relevant foundation for research is surely important, as it provides and structures the information, which should attract attention of the managers in order to make

relevant decisions. However, the implementation phase of the balanced scorecard is important as well, because not only the information is crucial; the way in which managers interpret and use the provided information is also making a significant influence on the research (Otley, 1999).

Wagner & Kaufmann (2004) investigated the barriers for successful implementation of balanced scorecard. The results of the research proved that the most crucial barriers in terms of level of threat and difficulty are:

- lack of purchasing vision and strategy,
- difficulties identifying strategic objectives and cause-effect relationships between the performance results and their drivers, [1]
- lack of completeness.

The barriers, named above, clearly identify that the issues, arising during the implementation of the balanced scorecard, are related not to the concept of balanced scorecard itself; they are rather associated with the lack of broad understanding of the strategy of a procurement department and the understanding of the way that the performance should be optimised (Wagner & Kaufmann, 2004).

The findings of Wagner & Kaufmann (2004) identify that despite broad procurement research, academic and managerial literature and guidelines, the companies are still facing difficulties in implementing performance measurement systems due to the lack of understanding the procurement system, its external stakeholders and influential factors inside and outside the company, what are the primary drivers of procurement performance, what influences and modifies the performance. In this case, even the most advanced performance measurement system will not generate required results. Surely, it can still provide the diagnostic measurements, however they will be neither proactive, nor highly applicable.

Thus, it can be concluded that even if performance measurement is highly beneficial tool, which can drive significant procurement contributions to corporate performance, the lack of knowledge about the procurement function as a system and the relationships between

[1] The drivers of performance are naturally embedded in the strategic objectives, if the objectives are set properly

various factors in this system is preventing successful implementation of the performance measurement systems, in this case - the implementation of the balanced scorecard.

The lack of understanding about procurement as a system is one of the main issues, preventing successful procurement performance measurement as well as all benefits originating from it.

If returning back to the most generic problem in procurement – finding the balance between the cost and the quality, this conceptual issue has high importance in the case of identification of procurement performance drivers, setting objectives and interpreting the results. It can be expected that due to this conceptual issue of finding the balance between cost and quality, the complexity of performance measurement increases, as the threat of sub-optimisation is very high. Thus, it is even more important to understand the procurement as a system.

Building upon the previously listed issues, emphasizing the problem of deep understanding of procurement as a system, the following questions arises, creating a foundation for the research of the Master thesis.

Firstly, the identification of the procurement system, its parts, relationships between them and their functioning principles are necessary for creating a procurement performance measurement system. As the performance measurement tool, in particular balanced scorecard, is considered to be the summarizing tool for procurement system, we see the strategic success factors as antecedents for procurement optimisation objectives and consequently for Key Performance Indicators (KPIs). Thus, the research logic for procurement system is based on antecedent-consequence relation. Based on this consideration, in order to represent the procurement system, the antecedents of procurement performance and procurement KPIs must be identified. Moreover, the relationship between them must be assigned in order to contribute to understanding of procurement as a system. Finally, the procurement system is surely a very complex system, having many internal and external stakeholders and other influential factors, which can be considered to be moderating the relationships in the procurement system – they must be surely identified too. Thus, the questions arise:

What are the relevant procurement success factors, their objectives and performance measures? What are the relationships between them and what are the variables, moderating them?

Surely, the complexity of the procurement system can become overwhelming, if the research is performed in a detailed level. However, if considering the purpose of the research to be facilitated achievement of success in procurement performance measurement, certain limitations must be drawn. As mentioned before, one of the main problems is the lack of understanding the procurement as a system. However, when applying the performance measurement system, the most emphasis is set on understanding the performance drivers in the procurement system. Thus, after presenting the procurement system, the most important performance drivers in the system must be identified, in order to ensure applicability for performance measurement. These performance drivers will surely be represented through finding the key procurement success factors and resulting KPIs. Thus, we search for an answer for the question:

What is the most important procurement performance driver?

However, defining the procurement system and emphasizing the most important areas might be not enough for creating an overall understanding of the procurement system, when the performance measurement target is not only diagnostics, but as well guiding optimisation. Thus, the guidance of how to achieve notable improvements in the procurement areas is necessary. The most important procurement optimisation areas are easily identified through evaluation of importance of the procurement performance drivers, perspectives, success factors an objectives. This process of identification of optimisation areas was described before. Thus, the following question must be answered:

How can be the most important areas of procurement optimized? What optimisation tools and methodologies and targets should be used?

Moreover, the research is aiming not only at building the theoretical overview and assumptions. The empirical research is needed in order to provide the relevant accuracy of the research and to ensure that the information, assumptions and guidelines are up-to-date. Thus the empirical testing, involving experienced procurement professionals is necessary. Also, one of the moderators of the relationships in the procurement system is assumed to

be the industry-related factor, as the approach of the stakeholders, as well as other influential factors, can differ much depending on the industry. Thus, the empirical analysis is targeting to answer the question:

Are the provided theoretical assumptions valid in practical business, particularly in pharmaceutical industry? What are the most important procurement success factors and procurement performance measures and optimisation tools in regard to production material procurement performance optimisation in pharmaceutical manufacturing companies?

Following the questions that were provided above, the main goals of our Master thesis are:

- To build a model, explaining the antecedents, consequences and moderating variables of procurement performance measurement and to define the main procurement performance driver
- To test the model in European pharmaceutical industry in regard to the main procurement performance driver
- To apply the results of empirical analysis for suggestions of building optimised procurement setup and strategy as well as performance measurement.
- To identify directions for further research

3. Methodology

We are developing our methodological chapter according to below illustrated structure.

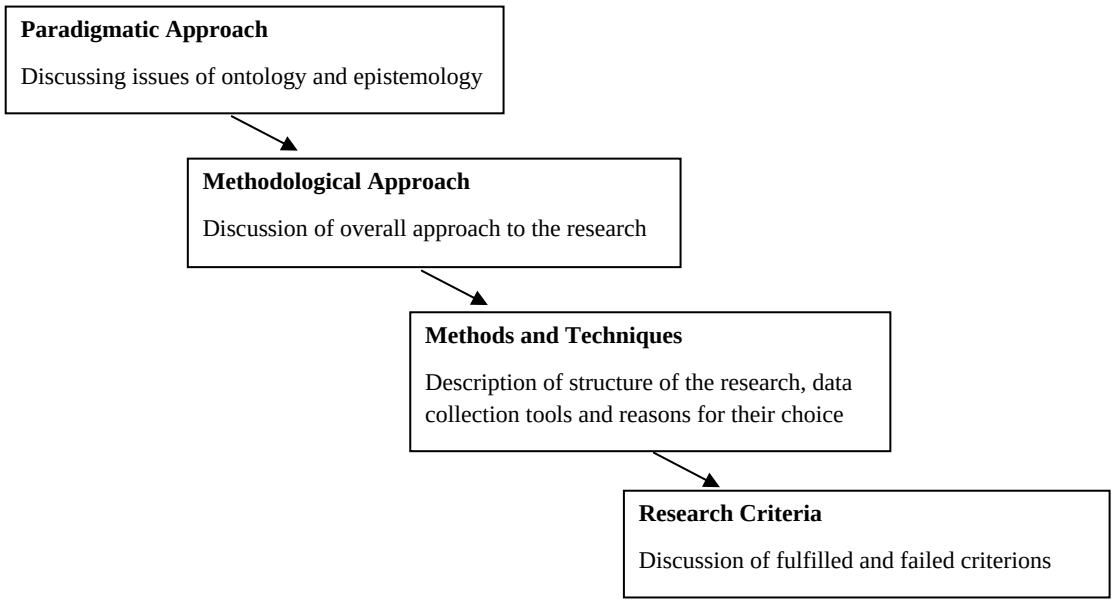

Figure 1. Structure and Levels of Discussion in a Methodology Chapter. Source: own creation.

Our *ontological viewpoints*, according to Abnor and Bjerke (1997), should illustrate our understanding of the "realities" and how we deal with them in our research, as well as how they influence our research design. *Epistemological considerations* explain how the researcher believes knowledge must be created in relation to two dominant paradigms – subjectivism and objectivism, which perspectives about knowledge creation are better reflecting researcher's view (Kuada, 2008). Another section of the chapter reflects *methodological approach*, which presents the systematic approach to our research. Lastly, the chapter of *methods and techniques* should describe tools used in the research which help solving the problem.

3.1. Paradigmatic Approach

3.1.1. Ontology

In this section we will explain ontological issues of our study, i.e. the way that we, as researchers, understand "realities" and how we face them in your research.

Objectivism and *constructionism* are the two positions in ontology, first of which states that reality of organisations is independent of "social actors" (Bryman and Bell, 2003, p.20), whereas second one asserts that organisations can be influenced by "social actors".

Organisations and their procurement departments are the targets of our quantitative investigation. We are interested in exploring the relations between organisations and their departments, but not the relation between organisation and people. However, people in organisations are still important for the research, as they contribute to gaining the knowledge. As we explain later about methodological approach, we are considering people in the companies as individuals, whose knowledge is formed by the systems, which we are interesting in. Therefore, they are able to provide objective information instead of their own subjective understanding. Thus, we can state that our research viewpoint towards the reality is objective.

More exact research approach to reality can be explained using Abnor's and Bjerke's (1994) categorisation. They differentiate six approaches towards the reality, one of which, i.e. reality as a world of symbolic discourse, reflects ours, as researchers', view towards the reality (see Fig…). In the latter case, the patterns of the relations appearing due to human actions and interactions are the object of investigation. In our research, one of the most important tasks is to find the factors/systems outside and inside the company, which are interacting with the procurement system and to explain the pattern of the most significant relations, which would help to optimise the procurement. Additionally, we aim at explaining the pattern of interfaces between the systems of procurement and other functions of a company (production, R&D, finance), i.e. what is the level of importance of each of these relations and how these interactions can create positive synergies for the company.

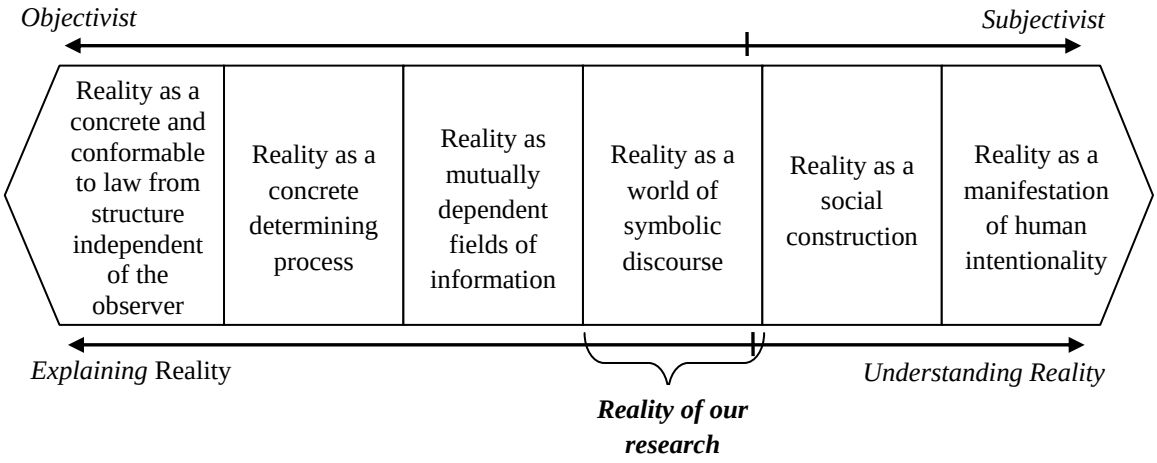

Figure 2. Ontological position of our research. Adapted from Abnor and Bjerke (1994).

3.1.2. Epistemology

Epistemological issue, or the view towards social world and natural sciences, has two opposite positions: *positivism* and *interpretivism* (Bryman and Bell, 2003). While positivism stands for the application of the methods of natural sciences for the social realism research, interpretivism keeps strict boundary between social reality – "people and their institutions" (Bryman and Bell, 2003, p.15), and natural sciences. Similarly, Maylor and Blackmon (2005, p. 140) suggest a distinction between two research approaches: scientific approach and ethnographic approach. Generally, the logic of the scientific approach is based on the measurement in order to achieve understanding. The tools, used in the scientific approach are surveys, experiments and databases, which are based on mainly numbers and create a particular measure as a result of the research. On the contrary, the ethnographic approach uses the observations and interviews as the most common tools, words are emphasized and their meaning is provided as a result. Moreover, the scientific approach tries to answer the questions "what?" and "how much?", whereas the ethnographic approach looks for answers to "why?" and "how?".

We guide our research with positivistic/scientific attitude. One of the leading aims in our thesis is to understand the most important factors, determining the success of procurement. We consider organisations as "concrete entities" (Pugh, 1983, p.45), where operations can be transferred into data, which we are able to collect and create measures for procurement optimisation. Thus, our investigation is based on the collected data, which is produced by

evaluating processes in companies. Theory will allows us to develop hypotheses which will be tested afterwards and findings will be made, which will be drawn into theory as new knowledge.

Additionally, we are implying a combination of deductive and inductive principles (see Figure 5) in our study, which means that we are developing our research through scientific statements and differentiate the roles of theory and research.

3.1.3. Paradigmatic Position

The understanding of *ontological* and *epistemological* positions of the researcher allow identifying paradigmatic position of the research. According to Burrell and Morgan (1979), they reflect the assumptions that researchers make about the nature of organisations and the way they collected the knowledge about them. According to Burrell and Morgan (1979), research on organisations can take one of four paradigmatic positions: functionalist, interpretative, radical humanist and radical structuralist. According to our position between the extremes of objectivism and subjectivism, as well as functional position of the research (regulatory or radical), our study reflects *functionalist position* (see Figure 3).

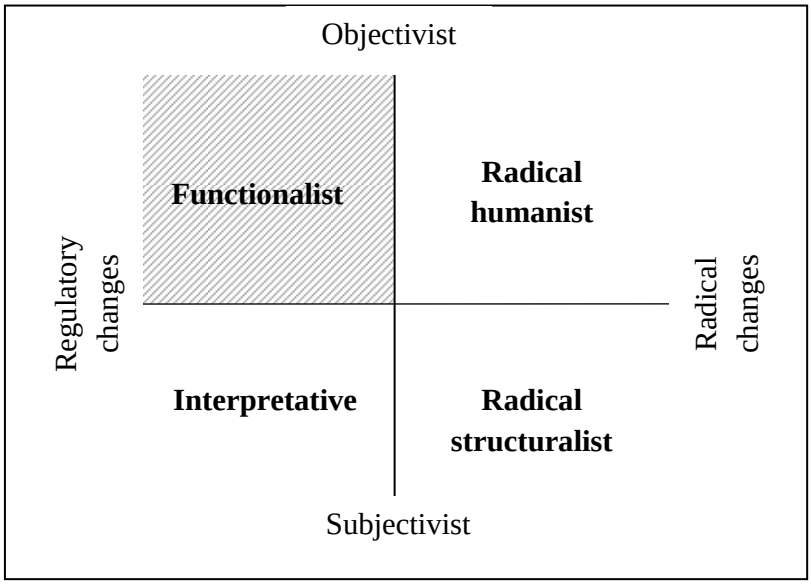

Figure 3. Paradigmatic position of our Master thesis. Adapted from Burrell and Morgan (1979).

With the explanation of mentioned assumptions, we want to tell, that we are analysing organisations as systems which also involve people, and our role is to be independent on organisation value observers. Thus, objectivist approach is characterising our research. Additionally, as we have mentioned in epistemological considerations, our research is directed towards understanding purposes rather than explaining and suggesting radical changes in procurement area, therefore we will suggest regulatory changes in companies' procurement function.

3.2. Methodological Approach

After discussion of paradigmatic position of our research, we will explain chosen methodological approach of our study. Abnor and Bjerke (1994) suggest three possible approaches: analytical, systems and actors approaches. Whereas analytical investigation is related to finding only cause-effect relationships of single elements, we are interested in different kinds of relations: cause-effect relations and producer-product relations, which could explain how "purposeful forces" are influencing our system, in order to find a way which would guide the strategic procurement development. Additionally, synergy effect, enabled by relations between systems or elements, is very important in our work and reflects systems approach, whereas synergies are irrelevant in analytical approach.

Moreover, the relations analysed using actors approach are dependent on the people inside of organisation, thus they are dialectic and not objective. We are aiming at investigating companies as objective realities and creating a framework suitable for all companies in chosen industry, and not at finding implications for specific company, thus we have rejected actors approach.

While systems approach can be used for explaining (explanatics) or understanding (hermeneutics) purposes, we are approaching the knowledge as explanaticists. With the help of the survey, we are getting the knowledge of individuals from the systems of Procurement departments (explained below). The knowledge which they are providing, is related to the behaviour in and strategies of Procurement function, thus, we consider that their answers to questionnaire are conditioned by present strategies and behaviour of the procurement in companies where individuals are working and not by their subjective

understanding, which would already mean that we are approaching the system as hermeneuticists.

The model of the system, which is showing relations, relevant to our research, is shown in the Figure 4 and explained below. It reflects the system of raw material procurement and it can be used not only in pharmaceutical, but also in other manufacturing companies.

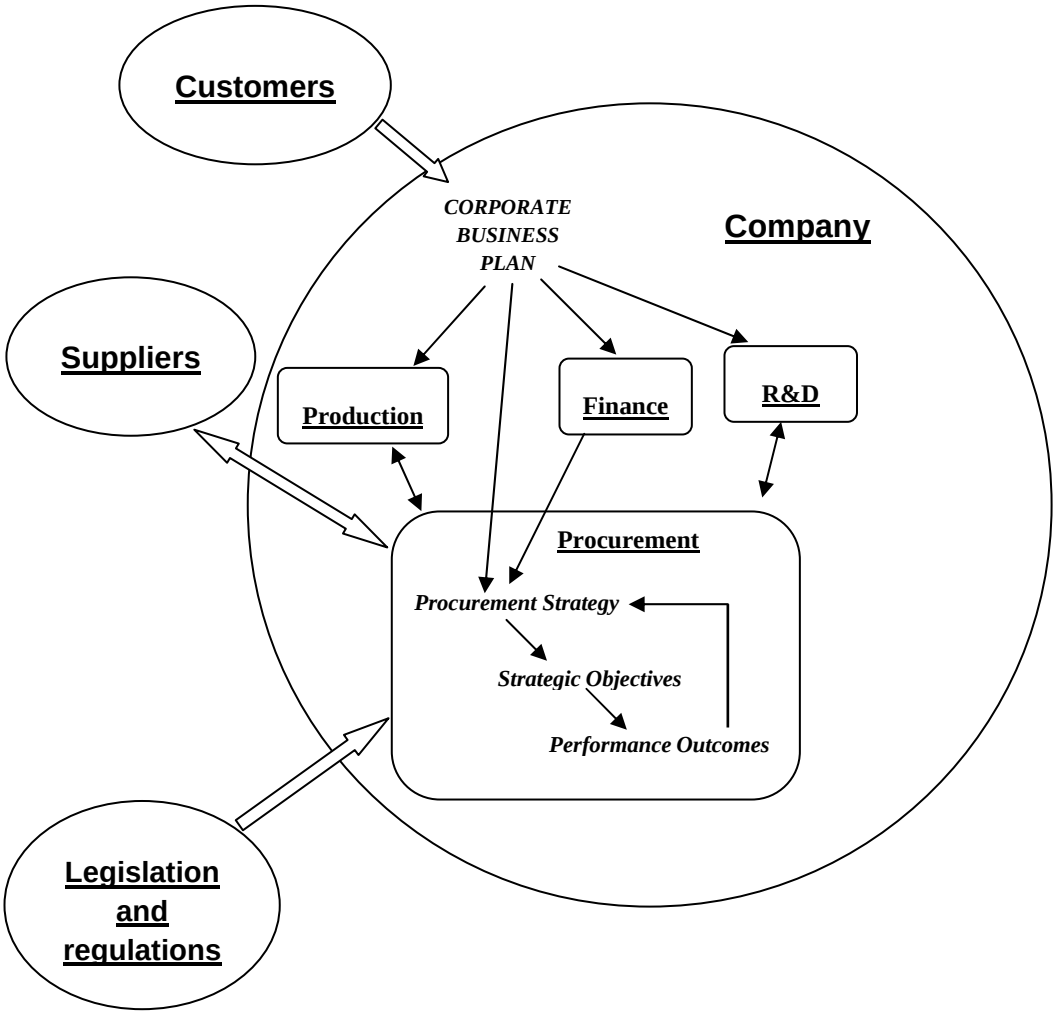

Figure 4. Raw material procurement system, its supersystem and forces, influencing the system. Source: own creation.

The main system in our research is Procurement department (called just "Procurement" in the figure). The important factors and processes, influencing one another, also all performance of procurement department/function are illustrated inside the system of Procurement department. There are two types of purposeful forces affecting the Procurement: these ones caused by members of supersystem and the ones that are caused

by external systems. The supersystem, Company, contains not only the system of Procurement department, but also other systems (other departments). These systems, which have direct influence on Procurement, are also illustrated inside of the Company. The systems of R&D, Finance and Production act as purposeful forces on the system of Procurement. Additionally, Procurement department may influence R&D and Finance systems as well.

Procurement system contains important processes which are shaping one another in a way that is illustrated in the Figure 4 (procurement strategy is shaping strategic objectives, these are affecting the performance outcomes, which are reshaping procurement strategy).

Furthermore, our analysed Procurement department is related to several external systems: Customers, Suppliers and Legislation and regulations. Procurement is indirectly related to Customers – procurement department purchases raw material for the production of the goods which are suggested to the customer, thus the quality and price of the goods depends a lot on the raw material provided by procurement department. On the other hand, Customers are also influencing procurement indirectly. Company is shaping its corporate strategy regarding customers' demand and their evaluation of the products that they buy from the company. Consequently, the strategy of the procurement is formed according to the corporate strategy.

Suppliers and Procurement have two-way relation. The relation is appearing due to communication and negotiations among these systems. The main target of negotiations is usually price and quality of the product. Additionally, when strategic supplier relationship management is applied, the communication is developing in order to create closer relation between supplier and procurer and to develop products. The relation and communication between the two systems is widely analysed in our work in theoretical part (Sections 4.4.2. and 4.4.3)

Legislation and regulations also have an effect on Procurement system as they are limiting actions and strategy of procurement. An example of such limitation in pharmaceutical manufacturing industry may be related to the material quality requirements.

3.3. Research Methods and Techniques

After formulating the problem, we decided to use quantitative research method. Our choice was influenced by time and financial resources, additionally, by the scope of the research problem. Interviews could be a suitable mean in order to get comprehensive knowledge from procurement departments, however, time and financial resources would be a barrier for this choice, taking into consideration the fact that we are analysing pharmaceutical industry exceeding the scale of Denmark. Self-completion questionnaire sent out in electronic way could thus provide us with a possibility to collect data from bigger number of companies and to get representative results for raw material purchasers in European pharmaceutical manufacturing companies. Moreover, as discussed before, there is a lack of academic literature related to purchasing performance measurement. A desirable tool, commonly used before administering a self-completion questionnaire in such cases is pilot study. The pilot study is applied in quantitative analysis for testing if research instrument as a whole functions well. (Bryman and Bell, 2003, p. 170). Also, our research has limited time resources. Thus due to knowledge and time limitations we are aiming to make a pilot survey in the empirical analysis, in order to create guidelines for further research and practical procurement optimisation.

Moreover, there are two theories, helping to integrate theory and research and design relationship between them. These are inductive and deductive theories, which were already mentioned in section about epistemological considerations. When an investigation is approached from the deductive view, it is based on existing theories and applies the knowledge from theories for making recommendations for practical case (Bryman and Bell, 2003, p.10). Inductive theory tells that the researcher is developing new theories based on observations and findings (ibid., p.12).

We have chosen quantitative research method, thus, deductive research type is more suitable. We develop our study in clear steps, starting with theoretical background and at the end involving inductive approach. The research design, reflecting mentioned approaches, is illustrated in Figure 5.

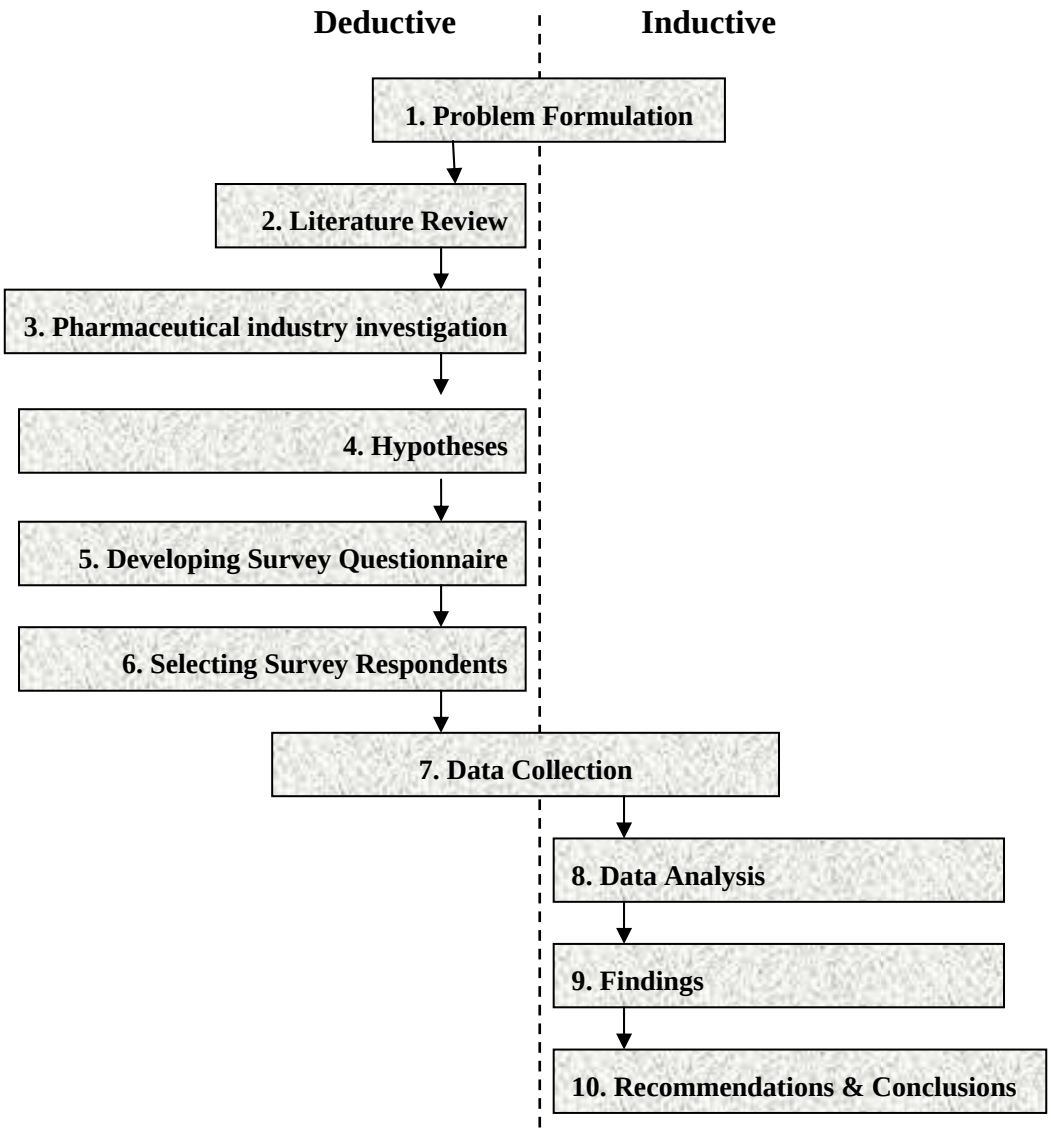

Figure 5. The combination of deductive and inductive approaches in our research. Source: own creation.

We have found the lack of scientific knowledge in the field of performance measurement of procurement. Thus, we have first analysed the existing literature which was relevant for our research topic and which helped us to construct a framework for procurement performance measurement. Additionally, it was important to define features and trends of pharmaceutical industry, which are related to raw material procurement. The latter and theoretical chapters allowed us to make assumptions about which forces are the most important in raw material purchasing performance and what variables are determining these forces. Consequently, we were able to formulate the hypotheses.

As the fifth step, we have developed a self-completion questionnaire (Annex 2) for our quantitative research in order to confirm or deny the hypotheses. In the presentation (Annex ..) of our questionnaire, we have underlined the responsibilities of the person, who should answer the questionnaire, in order to avoid the possibility that not competent employee would become our respondent. Moreover, such details were mentioned, as the type of the company which we were interested in, the purpose of our research, anonymity, an approximate time that would be taken to fill in the questionnaire, and appreciation for filling in the questionnaire. Additionally, the possibility to order the electronic copy of finalised Master thesis in exchange was suggested to the respondents.

The questionnaire first included general questions (size measures of the company, location of procurement head office and job title of a respondent) in order to be sure that the company and person are suitable for our sample. The questionnaire consisted predominantly of closed questions, which makes it easier for respondents to answer them (Bryman and Bell, 2003, p.158), thus respondents have to spend less time on each question and the possibility to receive fully filled questionnaire increases. Additionally, the open space was left after some of the questions in order to give possibility for the respondents to note any other important measures which we have missed while identifying most important measures.

After the questionnaire design, the next steps are to select respondents and collect the data. Our target respondents were employees, who are working in pharmaceutical manufacturing company and who are involved in any level of raw material procurement management for pharmaceuticals' production. We did not have any source of the contacts of suitable people, thus we have used several methods for creating the sample of the survey.

1) Firstly we have sent the inquiries to a large number of European procurement associations and pharmaceutical associations in different countries. Unfortunately, only several responses came and with negative answers.

2) Afterwards, we have sent e-mails to a number of companies (to their general e-mails for inquires) which fit into our research limitations, asking to provide the emails of one employee from each company who would have described responsibilities. In such way we received four contact emails of potential respondents and several negative responses.

3) We have collected a list of companies, including the ones which did not respond to the e-mails sent earlier. The companies, which are originating from the countries with highest pharmaceutical industry development level in Europe[2], were primarily chosen (e.g. France, Germany, Switzerland, etc.), thus, assuming that their procurement is strategically well-developed and their contribution to the survey could give good outcomes for our research. Next, we have tried calling to the companies and establishing initial contacts. However, this method requires a lot of time due to a necessity to make at least several calls to one company in order to find the directions to the right employee. Additionally, many receptionists in companies were not willing to redirect the call to the suitable person due to the company's policy.

4) Lastly, due to time limitation we were not able to make more calls, thus, we have sent out emails with the link to the questionnaire to a number of companies (using e-mail addresses for general inquiries), that were not contacted before, and asked them to forward the link to the required person in their company, however this method almost did not give results.

After executing the survey, we have analysed collected data using SPSS program. We have used several techniques of quantitative data analysis: Scheffe test and calculation of Euclidean distance – to confirm or deny the hypotheses, ANOVA – to test the relationships between variables, histograms – for visualising the results.

In step 9 we are interpreting the results of analysed data and considering if our hypotheses are supported. Finally, according to the findings of the study, we discuss the implications of our findings for the theoretical background, which we used for building our research.

3.4. Evaluation of the Research

Four criterions are described in this chapter and their appliance in our thesis is discussed. The criterions are necessary in order to evaluate the quality of chosen design of the research for our thesis. Bryman and Bell (2003) stress the criterions of reliability, replication and validity. Further analysis is based on their explanation. Additionally, the fourth criterion, relevance, is analysed according to Hammersley (1992).

[2] Countries were chosen according to pharmaceutical production statistics from EFPIA (2008, p.11).

3.4.1. Reliability

Reliability concept is related to a repeatability of results of the research (Brymann and Bell, 2003). Authors explain that the repeatability is achievable when consistent measures are used in the research.

- Firstly, *stability* in measures over time is an important characteristic in quantitative research. It could be evaluated if after administering the measures to a sample of respondents one time, it would be repeated second time with the same sample. However, we do not have a possibility to evaluate this criterion, thus, we cannot claim that our measures are stable over time.
- *Internal reliability* tells if a multiple-item measure is coherent, i.e. if indicators are related to each other.

3.4.2. Replication

We have described different processes and elements of our research in detail. Thus we can assume that we have fulfilled the replication criterion. The application of this criterion makes the research building process available for others and thus helps to reach more convincing results. Additionally, replication is also very closely related to reliability. If the description of sequence and context of the research is very detailed, it is more reliable. If it is lacking of details, some uncertainties may appear for readers and a level of reliability is low.

3.4.3. Validity

Brymann and Bell (2003) tells that it is important to consider two main types of validity in a research:

- External validity helps to create a representative sample. Our research contains a pilot survey with the small sample, therefore we are not applying this criterion tour research.
- Ecological validity aims at stating if the findings of the research are applicable to everyday life and natural social settings. Our study may not fully meet this criterion because our research tool is a questionnaire. Thus, we cannot be guaranteed that the

answers of respondents really reflected their and their department's behaviour in every day work. Additionally, Cicourel (1982, in Brymann and Bell, 2003) is raising a question of whether respondents have necessary knowledge for answering the questions. Regarding this aspect, we are sure that our respondents had this knowledge due to their job function and clear instructions given in the covering text about a person we needed in the company.

Even though our research does not fully meet ecological validity due to used instrument for the research, we believe that this was the best way to do investigation in order to fulfil the aims (refer to the chapter) of the Master thesis considering time limitation and available resources.

Whereas Bryman and Bell (2003) emphasise above named criteria for research design evaluation, Hammersley (1992) is also suggesting taking into consideration relevance criterion. Thus, we are discussing in the following section.

3.4.4. Relevance

Criterion of relevance is concerning the importance of the topic in certain field or contribution to the existing literature in related field. This Master thesis can be named as fulfilling relevance criterion due to following main objectives: 1) building a framework which can be used as a basis for procurement optimisation strategies and which is supplementing previous literature on procurement management and optimisation, and 2) reaching the findings that will be new and valuable for business in pharmaceutical manufacturing industry.

To be more specific, it was discussed in Chapter… Problem Formulation that there were many researches done on procurement optimisation before, however they were oriented only towards financial results and financial past performance, without analysing operational details and management. In our Thesis we are using Balance scorecard framework as a basis for considering all perspectives affecting the procurement performance and identifying a number of factors (in different perspectives) which should be analysed while creating the procurement performance optimisation strategy. This is

going to be an input of our research into the existing literature on procurement performance management.

Additionally, according to the built framework on antecedents and consequences of procurement performance, we are going to use it in pharmaceutical manufacturing industry in order to lead companies to the procurement performance optimisation strategy.

4. Theoretical Framework

4.1. Procurement Concept and Role in Supply Chain Management

We are starting building theoretical framework by introducing the perception of supply chain and analysing different suggestions of what is the role of procurement in a company and how procurement should be approached. Accordingly, we formulate a definition of procurement which would guide further process of our Master thesis.

Concept of supply chain

Supply chain management (SCM) – extremely popular research topic today. Mentzer et al. (2001) suggests several phenomenons as the reasons for that. First, the supply chain management came together with the start of global sourcing. Due to the increasing global sourcing among the companies, they were forced to look for more efficient and coordinated flow of materials into and out of the company, which can be achieved by closer relationships with suppliers. Second, companies started competing more on the basis of time and quality, together the requirements of customers have increased. Both of mentioned factors - global orientation and increased performance-based competition - caused increased environmental uncertainty and the need of closer coordination with suppliers and distributors.

Regardless of the popularity of the supply chain management concept, still a lot of uncertainties appear regarding its meaning. Lambert et al. (1998) presents a supply chain as a network of members and the links between members of the supply chain. Additionally, the third element - business processes – create a value for the customers and they have to be integrated and managed across the supply chain by the management components.

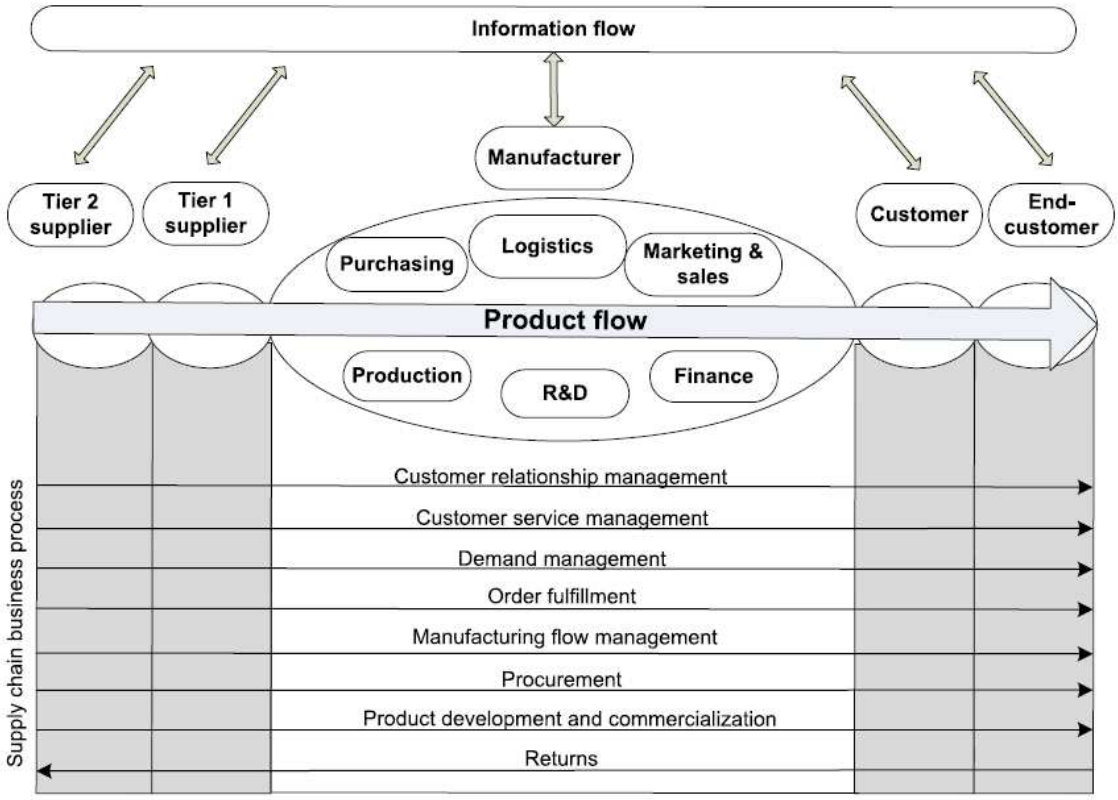

Figure 6. Supply Chain Management: Integrating and Managing Business Processes Across the Supply Chain. Source: Lambert et al., 1998.

The figure demonstrates the supply chain network, where the functions of a company are illustrated (e.g. logistics, marketing and sales), aligning in the supply chain together the suppliers and the end users. The information flow, product flow and key supply chain business processes are stretching through all the supply chain from the original supplier to the end user, while creating the integrated processes in the supply chain. Moreover, business processes in integrated supply chain become supply chain business processes extending across intra- and inter- company boundaries. (Lambert et al., 1998)

Mentzer et al. (2001) defines a supply chain as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer. Mentzer et al. (2001) identifies three degrees of supply chain complexity: a “direct supply chain,” an “extended supply chain,” and an “ultimate supply chain.”

A direct supply chain includes three elements: a company, a supplier, and a customer involved in the upstream and/or downstream flows of products, services, finances, and/or information (Mentzer et al., 2001).

Figure 7. Direct supply chain. Source: Mentzer et al., 2001.

An extended supply chain includes several additional links: suppliers of the immediate supplier and customers of the immediate customer. All links are involved in the upstream and/or downstream flows of products, services, finances, and/or information (Mentzer et al., 2001).

Figure 8. Extended supply chain. Source: Mentzer et al., 2001.

An ultimate supply chain consists of all the organizations involved in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer (Mentzer et al., 2001). The third figure briefly demonstrates the complexity that ultimate supply chains can reach. The example of the additional elements (comparing with the extended supply chain) that can exist in such supply chain is third party financial supplier, which may be providing financing, assuming some of the risk, and offering financial advice. Moreover, a third party logistics (3PL) provider can be providing transportation services between several companies, whereas a market research firm can be supporting a company with the information about the ultimate customer.

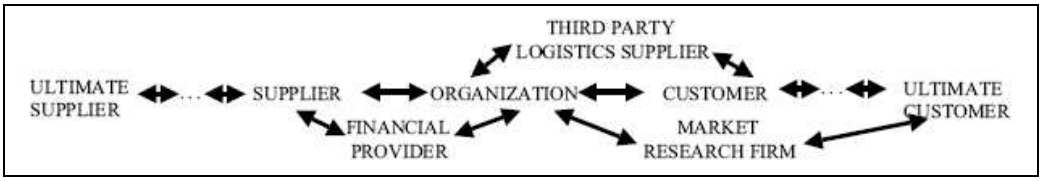

Figure 9. Ultimate supply chain. Source: Mentzer et al., 2001.

While approaching the topic of our thesis, procurement is identified as one of key business processes in the supply chain together with customer relationship management, customer service management, demand management, order fulfilment, manufacturing flow management and product development and commercialisation (Lambert et al., 1998). That

means that it is one of the components which make a significant importance for company's performance. However, procurement is sometimes still seen as simple purchase or acquisition of the physical resources that company needs and no strategic importance is given for such purchasing. Further literature review identifies the researches of the scholars made on the questions addressing the necessity of strategic management of the procurement and its significant in business performance. Different authors in some cases mean the same by using terms "strategic procurement" or "strategic purchasing". Moreover, sometimes only the term "procurement" is used while having "strategic purchasing" in mind. We are using "strategic procurement" concept in the thesis, however when different authors are cited, other terms than this may be used.

Strategic procurement

The ideas about the necessity for the firms to give more attention for the purchasing function and the whole procurement department were already demonstrated at the beginning of the 1990s. Pearson and Gritzmacher (1990) proposed that purchasing function has to be oriented to strategic roles. Besides, procurement and supplier management needs to interact with other departments via the purchasing function in order to improve the monitoring environment of the supply market Pearson and Mendez (1994) suggested that procurement and supplier management must have the ability to execute the following activities: quality requirement assessment, training, supplier selection, total cost analysis, evaluation standards, strategic alliances and collaboration. Cox (1996) raised a problem of conceptualization and theory building within the developing discipline of purchasing and supply chain management. One of the questions addressed in his article was about the concept of strategic procurement management and the way that it differs from the traditional conception of purchasing and supply management. He stressed that there must be an attempt to provide a theoretical clarification of the optimal role for procurement within business management. Only in this way it is possible to develop operationally practical concepts, tools and techniques and to assess under which circumstances and conditions they are 'fit for purpose' (Cox, 1996), where the main 'purpose' of every company is a profit.

Cox (1996) investigated the way to approach the effective business strategy through the strategic procurement management. The first and the vital point on which the author is basing procurement management model is proactive approach and in no case it can be

reactive. If company is basing its business management on such approach, then company's boundaries need to change constantly in response to customer's preferences and the strategic procurement management must always focus on the ultimate role of the company.

Furthermore, Cox (1996) notifies that it is crucial to understand what adds value for the business and what profit margins are. That can be reached by proactive behaviour of decision-maker and constant seek of how the costs and value are created in their supply and value chains, also in relation to the competitors. Only in that case strategic procurement management approach can be implemented because the very first task of this approach is to undertake value chain positioning. Value chain positioning concept means "the process by which the key decision-makers within a firm consciously undertake market positioning through an analysis of the totality of supply and value relationships within their markets" (Cox, 1996, p. 69). While the company is heading to achieving sustainable profitable advantage through the strategic procurement management, a number of external contractual relationships have to be considered. The decision of which ones of them 'fit for purpose' can not be made only in relation to upstream external supply management. The decisions of procurement managers have to be made on the basis of the corporate strategic goals of the company in terms of its market and value positioning objectives.

In relation to the positioning of the procurement activities in company's value chain, in 1985 Porter has composed a value chain differentiating primary and supporting activities (van Weele, 2005). Primary activities are related to physical transformation and handling of the product that company is producing and distributing to its customers, whereas procurement is one of the supporting activities, which are enabling and supporting the primary activities. Procurement here relates to the activities of purchasing, some of which may be purchasing raw materials, manufacturing equipment, or buildings. These purchasing actions can be related to all primary activities and go along with supporting activities, such as technology development, HR management and firm infrastructure, therefore Porter has distinct procurement as supporting activity for creating value in a company (van Weele, 2005).

Furthermore, Chen et al. (2004) distinguish slightly different approach to the success of the business through the strategic procurement. They state that strategic procurement is a vital link in a working supply chain and that strategic purchasing can give a competitive advantage to a firm by enabling the firm to: 1) foster close working relationship with

limited number of suppliers, 2) promote open communication among supply chain partners and 3) develop long-term strategic relationship orientation to achieve mutual gains.

Researchers feature procurement with two major goals (Lambert and Cooper, 2000; Skjott-Larsen et al., 2003; Christopher and Gattorna, 2005; Wisner, 2003; Piramuth, 2005): to ensure an uninterrupted flow of raw materials at the lowest total cost, and to improve the quality of the final product and to react rapidly to market changes.

Scholars agree that strategic procurement management is crucial for better financial performance of a company (e.g. Kerkhoff, 2005, Dimitri et al., 2006). Kerkhoff (2005) notices that of the financial situation of the company through the procurement function can be improved by locating and exploiting the potential for increased profit and reduced procurement expenditures. Moreover, the way managers design the procurement has a major effect on company's performance in both short and long run (Dimitri et al., 2006). Procurement is influencing short-term performance because it is immediately determining the cost and quality of inputs in the supply chains; whereas procurement has a great significance for a long-term performance by determining suppliers' and more generally firms' incentives to invest in R&D and to innovate in general (Dimitri et al., 2006).

Additionally to the improvement of financial measures, the shift from simple purchasing to strategic procurement (in different literature it may be named as strategic purchasing) would raise the role of procurement department to the higher position, equalling its importance to the research and development, production or marketing and sales, which would provide purchasers with a chance to contribute their know-how to the strategic corporate decisions (Kerkhoff, 2005).

Kerkhoff (2005) suggests several phases of the provision of strategic procurement. First, an analytical background for accounting from existing data and information has to be created. That means that an effort should be put in mechanical and very detailed work. Second, creative work is required in order to develop an efficient profit-oriented procurement strategy, which has to be consistently implemented.

According to the reviewed literature and different suggestions for strategic procurement management, we have defined strategic procurement as:

A business function which is responsible for management of firm resources on the basis of corporate goals, while proactively seeking for long-term external relationship and integration along with internal functions of the company.

Despite the increasing evolution of procurement towards a strategic function of a company, which creates constantly increasing complexness of this function, the main objectives of the procurement department can be identified simply as (Pooler & Pooler, 1997):

- *To ensure economic supply by the procurement of goods, supplies, and services to keep the company in operation*
- *To contribute to profits by efficiently controlling the flow of money passing through the operation*

4.2. Business Performance Measurement

In sub-chapter 4.1. we have introduced the concepts of procurement and supply chain. Now we are going to approach business performance measurement topic.

We have already mentioned in problem formulation chapter, that procurement measurement is recognised as a tool for procurement optimisation guidelines. Therefore, performance measurement takes very important role in building our procurement optimisation framework. In this chapter we are first introducing companies' performance measurement topic in general and explain why we are choosing the balanced scorecard model as a basis for further development of our thesis.

Subsequently we describe the balanced scorecard method more detailed and describe different business perspectives included in balanced scorecard model. Additionally, we present the concept of Key Performance Indexes, which are the part of BSC model, and which are used to measure different areas in business performance.

4.2.1. Tools and Techniques for Performance Measurement

Bull (2007) identified three dimensions, upon which the performance could be measured: efficiency, effectiveness and efficacy. The choice of the relevant measurement dimensions is dependent on the strategy chosen:

- The efficiency dimension is related to the resource-based view of a firm, when the emphasis is noted on how efficiently the resources of a company are used.
- The effectiveness dimension is based on the market-led strategy, when meeting customer demands and creating added-value is essential
- The efficacy dimension, founded on success-led strategy, when the measures are targeted at evaluating, how well a company is able to achieve its vision and purpose.

Bull (2007) claims that the third dimension – efficacy is rarely used, as the most common dimensions of performance measurement are efficiency and effectiveness. According to

the definition it can be understood that efficacy dimension is covering both efficiency and effectiveness dimensions and it is a very broad dimension. However, we are willing to perform a more detailed analysis of the performance measurement dimensions. Thus, we believe that as efficacy dimension is reflected by effectiveness and efficiency dimensions, it is reasonable to concentrate of only effectiveness and efficiency in our research. Consequently, efficacy will not be further investigated in our research. The chosen two dimensions, effectiveness and efficiency will be further discussed in the context of purchasing in chapter 4.3.3.

Performance measurement, according to the measurement recommendations, can have several kinds of frameworks:

- a structural framework (e.g. balanced scorecard (Kaplan and Norton, 1992)) specifying the typology for performance measurement management; or
- a procedural framework (e.g. Wisner and Fawcett (1991) framework) – a step-by-step process for developing performance measures from strategy.

A performance measurement framework facilitates the building of performance measurement system by:

- setting the boundaries for measurement;
- clarifying the dimensions or views of measurement;
- possibly predicting the relations among the dimensions.

(Folan and Browne, 2005)

The successful performance measurement system must contain two frameworks – structural and procedural, and a number of performance measurement tools, e.g. measures.

The balanced scorecard (Kaplan and Norton, 1992) is combining the financial measures with non-financial measures, which are evaluating the performance from three other perspectives (customers, internal business processes, and learning and growth); whereas other frameworks are relying on either only financial measures (e.g.) or only non-financial measures (e.g. Maskel, 1992, Dixon, et al., 1990). The balance of the measures enables companies to follow financial results and at the same time observe and control the progress in building the capabilities and acquiring the intangible assets they would need for future growth (Kaplan and Norton, 1996). In this way the balanced scorecard is not changing the

previous frameworks which are based on financial measures, but it is complementing them by additional view.

Moreover, the balance scorecard is oriented towards the long-term strategic objectives by ensuring that short-term actions are contributing to the long-term strategy. The short-term actions are linked to the long-term actions by four management processes: translating the vision, communicating and linking, business planning, and feedback and learning.

4.2.2. Balanced Scorecard

The balanced scorecard has gained a lot of attention due to its broad usability. It provides a framework for formulation of strategy, helps to communicate the strategic objectives, generate action plans and budgets, as well as facilitates development of information systems for performance measurement. Moreover, the balanced scorecard creates awareness of the strategic goals and consequent operational goals through cascading set of performance indicators, enabling well coordinated targets and behavior across the organization. (Beatham et al., 2004).

There are two key aspects in development of a balanced scorecard (Axelsson et al., 2002) :

- finding the factors, which are driving long-term performance in a particular organization of strategic business unit, and
- balancing the performance drivers, i.e. using measures from different and complementary functional areas

It is important to notice that the nature of balanced scorecard is contrasting with other traditional measurement systems, where mostly short-term and strictly financial measures are used. (Axelsson et al., 2002)

Thus, the balanced scorecard as a tool is beneficial for top level and lower level management as well as buyers, as it provides the clear understanding of relationship between objectives, activities and results; also it enables all these factors to be integrated into the management process. One of the main targets of our Master thesis is to investigate the previously mentioned relationship, thus the balanced scorecard is chosen to be used as the foundation. Following this foundation, in the next chapters we are going to investigate

the balanced scorecard for procurement departments, identify the crucial KPIs that should be used for performance evaluation as well as guide the management decisions.

The process of creating a balanced scorecard is suggested to be implemented using this basic scheme:

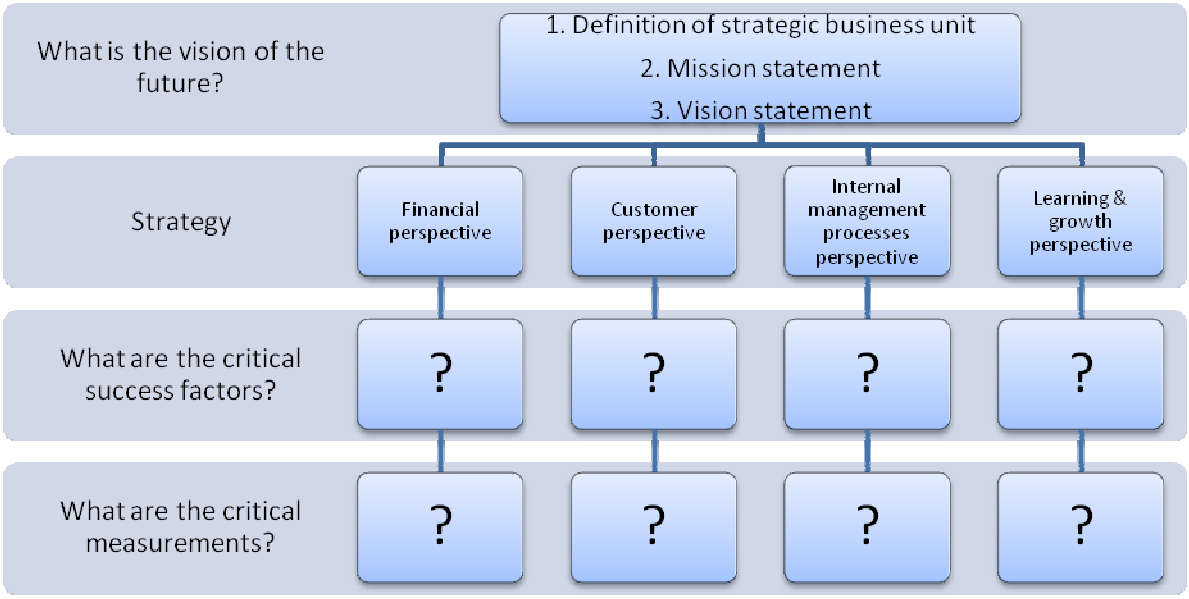

Figure 10. Implementation scheme for balanced scorecard. Redrawn from Kaplan and Norton, 1993 and Shaw, 1995, p.72

The future vision of the strategic business unit (procurement function in this case) should be converted into generic strategy, identifying main development directions. Moreover, the implementation of the strategy should be surely supported by a performance measurement system, based on four perspectives, identified by Kaplan & Norton (1993, 1996a, 1996b) – financial, customer, internal business process, learning and growth perspectives.

4.2.2.1. Financial Perspective

Naturally, the most obvious financial measures are related to the profitability of the business unit. Axelsson (2002) identified the financial perspective as the measures, related to the costs of running the operations and the results. However, depending on the life cycle of the business unit, other financial objectives can be applied. The main directions of non-profitability financial objectives are (Kaplan & Norton, 1996a):

- Rapid growth – conforming the business units in the early stage of development. These objectives emphasize development, particularly depending on the nature of the business unit e.g. investing in expansion of operational capabilities and systems, expanding global networks, developing relationships with various stakeholders, etc.
- Sustain – applied in developed business units, which still attract investments, however the emphasis on return on investments is introduced, in contrary to the rapid growth direction. The nature of investments in this stage is targeted at e.g. relieving bottlenecks and sustaining continuous improvements.
- Harvest – used in the mature business units, which don't attract investments any more, apart from repair and maintenance activities. The main target of such business units is to maximise the cash flow back to the corporation.

Thus, depending on the development stage of the business unit, the objectives and measurements are different. A business unit in the rapid growth stage will apply financial measures such as sales growth in new markets and with new customers, maintaining levels of investments into product or process development and employee capabilities. During the sustain stage, the traditional measures such as return on capital employed, gross margin, economic value added, shareholder value and others, targeting to the same concept – highest return on investment. Finally, as the harvest stage identifies the short time remaining in the economical life of the business unit, thus the measures are directed towards increased cash flow from the business unit to the company, in contrast to the reverse cash flow in the previous stages.

4.2.2.2. Customer Perspective

The customer perspective in based on particular customer segments, where the business unit is competing. A basic description of customer perspective, provided by Axelsson (2002), is the internal customers' views on the development of the operations. There are five main aspects of customer perspective, which must be measured in any type of the business unit:

- Customer satisfaction – this measure is extremely important, however it can be taken into account only when the customers are completely or extremely satisfied – only in this case customer retention and loyalty can be expected.

- Customer retention – a basic measure, identifying the customer retention rate (wiki – measured as the number of customers placing a second order in 12 months after the first order) as well as customer loyalty.
- New customer acquisition – rate identifying the number of new customers acquired in a certain period of time.
- Customer profitability – without customer profitability, the other customer perspective measures are irrelevant, as after all, the customer profitability is the most relevant measure. If the company finds out, that the efforts and investments required to e.g. a acquire new customer is higher than the margins earned from selling to these customers, the unprofitable customers should be discouraged.
- Market and account share – the measures are targeting at identifying the market share and account share (of 'customer's wallet' share) in the target customer segments. These measures are particularly important as they are complementary to the purely financial measures of sales, which can provide false positive results due to sales in the non-target segments.

4.2.2.3. Internal Business Processes Perspective

The internal business process measurements should focus on the most crucial functions of the business unit, which contribute the most to achievements in the financial objectives of the company as well as customer perspective.

The internal business process perspective reveals the significant differences between measurements in the balanced scorecard and other approaches. The difference mainly is noticed in attempt to improve the internal processes – the balanced scorecard emphasizes the crucial importance of innovation and the other approaches are limited to measurements of improvement in the existing processes. It is clearly proven that in order to achieve long-term success, innovations in services, actions and tools are necessary. On the other hand, improvements in existing processes can ensure only short-term benefits. Thus, balanced scorecard's framework is including both the improvements in the existing processes as well as innovations, as only in this way both short-term and long-term financial benefits can be achieved. Depending on the nature of the business, the examples of the internal

business process perspective could be the number of agreements settled, initiatives taken, etc., as defined by Axelsson (2002).

The internal business process perspective is illustrated in the picture below, presenting the three main functions of the perspective: the innovation process, the operations process and the postsale service process.

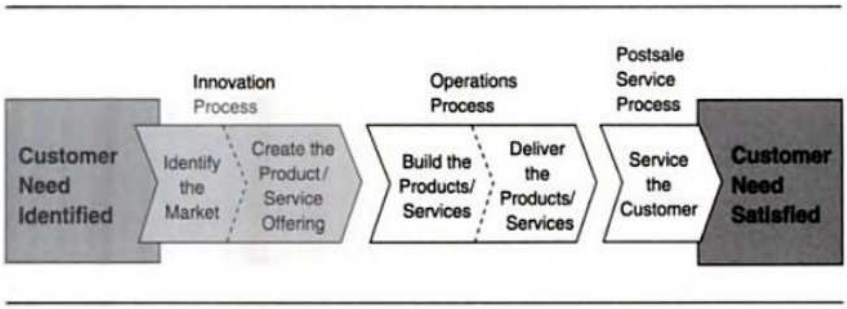

Figure 11. Internal business process perspective. Source: Kaplan & Norton (1996b), p. 98

4.2.2.4. Learning and Growth Perspective

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

- People – employee satisfaction, employee retention, employee skills based on the market requirements and investments in training in order to achieve them.
- Systems – the availability, suitability and usability of the IT systems, meeting employee and customer demands.
- Organisational procedures – improvements in the critical customer-based and internal processes.

Moreover, as Axelsson (2002) notices, the suitable examples of measures in learning & growth perspective could be the number of days employees spent in training, evaluation of new recruitment patterns, etc.

4.2.3. The Process of Setting KPIs

The basic content of a balanced scorecard can be described as a set of strategic objectives (normally not more than 20), ‘‘balanced’’ with respect to predefined perspectives, mentioned before. The link between the strategic objectives is established through a causal

link between strategic objectives within one perspective and between strategic objectives across perspectives must exist in order to achieve relevance of the balanced scorecard. These causal links are known as cause – effect relationships. Moreover, hypothesis regarding the strength of these relationships must be identified as it is suggested that only strong relationships should be taken into consideration when creating a balanced scorecard. (S. M. Wagner & L. Kaufmann, 2004) . The importance of successful identification of the relevant cause-effect relationships must be emphasized. The results of the empirical research made by Wagner & Kaufmann (2004) showed that one of the main issues when creating a balanced scorecard was to difficulties in identifying the strategic objectives and cause-effect relationships. The cause-effect relationships, as defined by Kaplan & Norton (1996b), can be described as a sequence of if-then statements and through the sequence of these relationships, the story of the strategy of the business unit should be explained. Moreover, in order to make a measurement system manageable and easy to validate, the relationships (hypotheses) among the objectives (and measures) should be clear and rigorous.

It (the performance measurement system) should identify and make explicit the sequence of hypotheses about the cause-effect relationships between outcome measures and the performance drivers of these outcomes. Every measure selected for a balanced scorecard should be an element of a chain of cause-effect relationships that communicates the meaning of the business unit's strategy to the organization.

Kaplan & Norton (1996b)

In order to be able to plan and control the achievement of the strategic objectives in different dimensions, a balanced scorecard is supplemented by key financial and non-financial performance indicators. For these performance indicators particular targets are set, guiding the behaviour of the company or business unit. (Wagner & Kaufmann, 2004)
When setting the measures in the balanced scorecard, it is important to distinguish between the diagnostic measures and strategic measures, in order to ensure the relevancy and optimisation. The diagnostic measures are evaluating the core factors, identifying the basic control of the business unit, which are crucial for the business unit in order to be able to operate. The strategic measures, on the contrary, are evaluating the factors which are driving the high performance and achievement of the strategic goals. It is suggested, that

the diagnostic measures should be only used for separate monitoring of the business unit and only the strategic measures should be included in the balanced scorecard (Kaplan & Norton, 1996b).

Generally, the suggested quality criteria of KPIs are under an acronym SMART, widely used in general management functions (Jones & Oliver, 2006). SMART consists of these factors:

S – Specific (clear, unambiguous, easily understood),

M – Measurable (being capable of reasonable measurement),

A – Achievable (a target that can reasonably be achieved),

R – Relevant (to the core business or service),

T – Timed (should have an agreed timescale).

4.3. Implementation Directions for Procurement Performance Measurement

In the previous sub-chapter (4.2. Business Performance Measurement) we defined general tools and techniques for performance measurement and the main principles of balanced scorecard for business performance measurement. Before adjusting the BSC for the procurement performance measurement, we want to explain several issues, which set certain specificity on the procurement performance measurement.

First of all we discuss barriers which are appearing during the implementation of the BSC in practice, in order to be aware of certain issues while building procurement optimisation framework further. Second, we are explaining the relation between procurement function and company's corporate plan, which would help while applying balanced scorecard for procurement department. Furthermore, we explain the dimensions of efficiency and effectiveness in procurement performance measurement, recommended by van Weele (2002), which would complement to BSC application to the procurement. Besides, procurement measurement and optimisation differs from one material group to another, thus we have differentiated them in Section 4.3.4.

Lastly, in Section 4.3.5 we consider what adjustments should be made in the general performance measurement model in order to make it suitable for comprehensive evaluation of procurement performance. We add the supplier perspective to the model and we group five perspectives under efficiency and effectiveness dimensions. According to these modifications, we will later introduce even more detailed procurement performance measurement model (Sub-chapter 4.5.3) and procurement measurement model for pharmaceutical manufacturing companies, which will identify most crucial areas for optimisation (Section 5.2.2).

4.3.1. Barriers in Procurement BSC Implementation

The application of the balanced scorecard for the purchasing department is not complicated from the first sight if all the guidelines provided by the experienced academics and practitioners are followed. However, the research of Wagner & Kaufmann (2004) proved it to be more difficult than expected.

The main barriers during initiation and set-up of balanced scorecard in purchasing function, as Wagner & Kaufmann (2004) claim, are:

- Lack of commitment, which means lack of motivation from people who develop and work with corporately initiated procurement BSC;
- Adverse support from consultants – experience is needed for implementation of procurement BSC, thus, if there is lack of experience inside the company, support from external consultants should be invoke;
- Lack of top-management support – top-managers should support the implementation of procurement BSC right from the beginning in order to make it successful;
- Insufficient alignment between BSCs in different areas of a corporation. It is extremely significant to align all BSCs in one company, in order to prevent sub-optimisation between different departments;
- Lack of purchasing vision and strategy – strategy must be clearly formulated, approved and frequently emphasized during the scorecarding process. Additionally, procurement strategy should support procurement vision, based on internal and external situation evaluation;
- Difficulties identifying strategic objectives and cause and effect relationships between them;
- Lack of completeness, happening in case when several elements of balanced scorecard are not completed, e.g. BSC matrix, BSC story and BSC map presenting strategic goals, indicators and targets for each perspective and cause-effect relationships between the objectives.

The research was based on case studies in 7 companies, which were attempting to implement balanced scorecard for their purchasing departments. The barriers that companies faced as well as the frequency of facing the barrier are presented in the table below. Moreover, the authors added their theoretical considerations about the importance of the barrier (‘threat’) and difficulty for solving the barrier, which can also be seen in the table below.

Barrier	Number of companies, facing average problems	Number of companies, facing major problems	Weight of barrier as a threat	Weight of barrier according to difficulty of solving
Lack of commitment	2	1	3	2
Adverse support from consultants	0	3	1	1
Lack of top-management support	1	0	3	3
Insufficient alignment	3	1	2	2
Lack of purchasing vision and strategy	3	2	3	3
Difficulties identifying strategic objectives and cause-effect relationships	4	2	2	1
Lack of completeness	1	4	3	1

Figure 12. Barriers for balanced scorecard implementation. Adapted from Wagner & Kaufmann, 2004

It can be noticed that the issues that have both the highest frequency and the highest threat/difficulty rates, are the 3 bottom issues, listed in Figure 12 above, i.e. the lack of purchasing vision and strategy, difficulties identifying strategic objectives and cause-effect relationships as well as lack of completeness.

4.3.2. Corporate Strategy and Procurement Performance Measurement

Procurement department, like all other departments in a company, is an element of the overall organisation, which must contribute to the achievement of the corporate goals. Thus a clear link between the corporate strategy and procurement strategy is crucial to understand, follow and implement in each function and action. The position of the procurement department in the overall strategic map of a company can be exemplified as in the picture below.

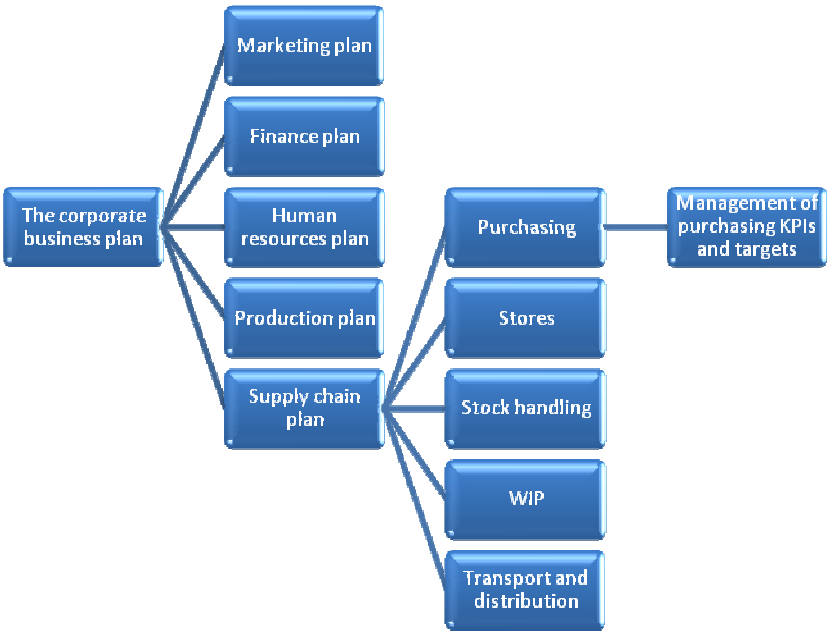

Figure 13. Purchasing position in corporate business plan. Redrawn from Jones and Oliver, 2006, p.39.

It is clear, that although each department has its own strategy, goals and KPIs, all these factors must feed upwards to the corporate business plan. Thus the mentioned factors are crucially dependant on the company vision, values and development directions, defined by the top strategic management team. (Jones & Oliver, 2006).

Moreover, the strategy and targets of the procurement function should not only reflect the company's vision and development directions, but as well should represent the perception of the top strategic managers to the procurement function. Consequently, the KPIs of the procurement function should also reflect the top management attitude towards procurement. (Farmer and van Weele, 1995)

Depending on the perception of the top management, there are several ways that purchasing department can be seen, organised and measured:

- Operational, administrative activity. This is the most basic approach towards purchasing, more noticeable historically, when the purchasing was considered to be a passive function of the company. ((Pearson and Gritzmacher, 1990; Carr and Smeltzer, 1999; Ammer, 1989). The performance measurement in this case is based on such factors as order backlog, purchasing administrative leadtime, number of order issued, adherence of existing procedures, etc. (Farmer & Van Weele, 1995)

- Commercial activity – a more sophisticated approach to purchasing, when the potential savings in the purchasing function are already perceived. This stage basic stage of purchasing was identified as 'basic financial planning' stage by Freeman & Cavinato (1990), when the emphasis of purchasing organization is only related to the budget Surely, the main focus in the measurement of the performance, similar to any commercial activity, is the financial benefits that should be achieved – normally price of the bought products/services and/or cost reduction, etc. (Farmer & Van Weele, 1995)
- Part of integrated logistics – in this case the purchasing department is already considered as an element of a system. Particularly, purchasing is seen as a part of the supply chain, where various parts have significant influence on each other (Lambert et al., 1998, B. Jones and J. Oliver (2006)). Thus the dangers of seeking for only financial profit only due to possible negative effects to the other elements of the supply chain and even other functions outside the supply chain. For example, if the price is lowered due to lower timely delivery expectation or quality of a purchased product, it leads to sub-optimisation, when only one element is optimised by sacrificing the other elements. In this stage the purchasing performance measurement is supplemented by measures of quality improvement, lead-time reduction and improved supplier reliability (Farmer & Van Weele, 1995)
- Strategic business area - many academics have written about the necessity for top management to see procurement as a function of strategic importance (Pearson and Gritzmacher, 1990; Carter & Narasimhan, 1996; Carr & Smeltzer, 1997,1999; Anderson and Katz, 1998). In the case of procurement as a strategic tool, the purchasing function is supplemented by such responsibilities as make-or-buy decisions, strategic corrections to the supply base and globalization of the supply base, etc. Thus, the performance measurement of procurement function is as well extended with measures such as number of changes in the supply base, number of international suppliers (Farmer & van Weele, 1995). Surely, the previous financial, supplier performance and other measures are not disregarded too.

4.3.3. Effectiveness and Efficiency Dimensions in Procurement

In order to measure the procurement performance, first the elements of performance should be defined clearly. Van Weele (2002) is differentiating two main aspects of the procurement performance: effectiveness and efficiency. Procurement effectiveness is the extent to which the previously stated goals and objectives are being met. It refers to the relationship between actual and planned performance of any human activity. Additionally, he explains that procurement efficiency is the relationship between planned and actual resources required to realize the established goals and objectives and their related activities, referring to the planned and actual costs. As a result, procurement performance is identifying the extent to which the procurement function is able to reach the objectives and goals with minimum costs.

The two areas of purchasing performance – effectiveness and efficiency – are divided into activities, which van Weele (2002, p. 258-270) defines as following:

- *Purchasing effectiveness* (effective measures require examining the relationships from both purchaser and supplier sides):
  - Purchasing materials costs and prices (evaluates the usual and paid prices for the materials and services):
    - *Materials price/cost control* – monitoring and evaluation of the prices of the materials and their increases that are announced by the suppliers in order to control them and make decisions about the supplier;
    - *Materials price/cost reduction* – aims at evaluating the initiatives related to the structured costs reduction of the materials, e.g. search for new suppliers, less costly substitutes for the materials, value analysis, etc.;
  - Product/Quality:
    - *Purchasing involvement in new product development* – by evaluating the correspondence of the new product target cost and time to market while using certain measures, procurement function may help to indicate the deficiencies in new product development projects. The measures can include: number of man hours spent by purchasing on innovation projects, the number of engineering hours spent by suppliers or the project's total lead time;

- Purchasing *and Total Quality Control* – indicates the extent to which the purchased materials incoming from suppliers are corresponding to the order specification. The measures can be the following: rejects rates on incoming materials, the number of lines rejected, number of approved suppliers, number of certified suppliers, number of reject reports handled, etc.;

– Purchasing logistics:

- *Adequate* requisitioning identifies the level of control of the on-time and accurate handling of materials request. Such measures as an average purchasing administrative lead time, number of orders issued, undelivered orders.
- *Order and* inventory *policy* relates to control of timely delivery by suppliers. Measurement of this performance aims at defining the level of control of the timely delivery by suppliers. The following measures can be used: supplier delivery reliability, shortages of materials, over/under delivery, number of just-in-time deliveries, etc.
- *Supplier delivery reliability* relates to the control of quantities delivered. Procurement has the responsibility of determination and control of cost effective inventory levels, therefore, for the performance evaluation the following measures may be used in this activity: inventory turnover ratio, number of over/under deliveries, pipeline, average order size, etc.

- *Purchasing efficiency*:

– Purchasing organizations:

- *Personnel* – background level, training, development and motivation of purchasing personnel,
- Purchasing *management* – quality and availability of procurement strategies, action plans, reporting procedures, management style and communication structure,
- Procedures *and Policies* – the availability of procedures and working instructions for purchasing staff and suppliers,

- Information *system* – effort for improving the purchasing information systems which is serving for daily work of employees.

4.3.4. Procurement Performance Measurement Dependency on Purchased Materials

Procurement process is applied on various sources and materials necessary for the company. According to the types, uses and the value of the purchased goods Gebauer, et al. (1998) distinguish between 3 categories of the procurement:

1. **Raw material and production goods** – the goods of this category are usually delivered by large quantities and high frequencies, they are characterised by important and unique specifications; moreover, just-in-time (JIT) delivery is often crucial (Gebauer, et al., 1998). Van Weele (2002) categorises this group more detailed. He names such groups, as raw materials, supplementary materials, semi-manufactured products, components and finished products.
2. **Maintenance, repair, and operating (MRO) supplies** – indirect materials or consumable items, necessary for everyday operations in the organisation. They are usually characterised by low unit cost and low volume, but relatively high frequency. The examples of such goods can be: office supplies, cleaning materials, maintenance materials and spare parts.
3. **Capital goods and maverick procurement** describes such goods which are having a large value but are purchased at low frequency (e.g., new factories or offices buildings, machines used in production, computers) or procuring items which are not included in the regular purchasing process, often for the reason of convenience or speed requirements.
4. Additionally, van Weele (2002) suggests one more category – **services**. It refers to the activities which are executed by third parties on a contract basis. Such services can include cleaning services or temporary labour.

Service sector, together with government and military, put emphasis on capital goods and MRO procurement. On the other hand, manufacturing organisations usually emphasise the procurement of capital goods and raw material. (Gebauer et al., 1998). We will analyse

only the procurement of the first material group (raw material and production goods) due to its larger potential to reduce the expenses in procurement in manufacturing companies, in comparison with other kinds of purchased goods.

4.3.5. Adjustment of Balanced Scorecard for Procurement

The broad applicability and flexibility were always mentioned as one of the key advantages of the balanced scorecard. However, it must be noticed, that application of balanced scorecard logic to the procurement function is a complex task. Thus, necessary changes and adjustments must be made, in order to achieve best results.

Generally, while applying the balanced scorecard to procurement, the initial setup, proposed by Kaplan & Norton (1992) can be used (Axelsson et al., 2002). As explained in the previous chapters, the framework consists of four measurement perspectives – financial, customer, internal business process and learning & growth perspectives. However, it must be noticed that the foundation of any BSC is the strategy of the company or business unit. As introduced before, a strategy map, one of the main elements of a BSC, targets a clarification of the 'if-then' hypothesis of the strategy (Kaplan & Norton, 1996b). Moreover, each factor of the BSC should be embedded in a chain of cause-effect logic, creating meaningful links between the desired outcomes of the strategy and their drivers. (Kaplan & Norton, 2000). Thus, as any BSC should be adjusted to the strategy of the business unit, in the case of procurement BSCs, the importance of optimized supplier performance must be emphasized as one of the main strategic objectives. Depending on what top-management perceives as the main performance drivers of the procurement function – whether it would be supplier base reduction, cooperation with supplier in the R&D phase or timely delivery, all these performance drivers must be represented in the BSC through strategic objectives and subsequently the performance measures and indicators (Axelsson, 2002). However, in the initial setup of the balanced scorecard, there is no clear link between the strategic objective of optimal supplier performance and any of the four initial perspectives. There were several different suggestions in the academic and managerial publications, how this issue should be solved.

Axelsson (2002) notices, that the relationship with the suppliers is influencing all four initial perspectives of the balanced scorecard, however it is not an explicit part of the

concept. The internal business processes perspective of the BSC can be claimed to be the most suitable for measures related to the supplier relationship management, if considering the initial BSC structure (Axelsson, 2002). However, the author clearly states that the previous solution is not optimal and that 'there should be something more explicit covering this area'. On the contrary to Axelsson, Baily et al. (2008, p. 419) suggests that the measures, related to supplier performance evaluation, would be included under the customer perspective of the balanced scorecard. (Baily et al,, 2008, p. 419). However, it might appear to be an unreasonable approach, as the customer perspective of the balanced scorecard was initially designed for totally different purposes. As mentioned before, the customer perspective should reflect the attitude of the customers towards development of the business unit, using measures such as customer satisfaction, customer retention, customer profitability or market share. However, in case of procurement, the purchasing department is a customer itself, thus the supplier performance cannot be evaluated in terms of customer response evaluation, as the performance drivers is the dimension of customers and suppliers can be observed as inverse and opposite. On the other hand, as the purchasing department is a customer itself, confusion of internal and external customers would be created if customer and supplier measures would be included under one perspective. Additionally, it must not be forgotten that clarity, explicitness and precision is one of the main characteristics of a successful balanced scorecard (Kaplan & Norton, 1996b).

Wagner and Kaufmann (2004) propose a possibility to add the fifth 'supplier' dimension to the balanced scorecard. As it was mentioned before, the supplier relationship measures deserve high attention due to their high importance on driving the performance of procurement. Thus the approach of Wagner and Kaufmann (2004) seems to be the most reasonable, well-founded and valuable, and it will be implemented in further development of our work.

Due to previous considerations, we expand the template of process of building the balanced scorecard (explained in the sub-chapter 4.2) by adding the fifth perspective of supplier performance. Additionally, the scheme is supplemented with efficiency and effectiveness dimensions, described in Section 4.3.3. The upgraded scheme of the balanced scorecarding process is presented below.

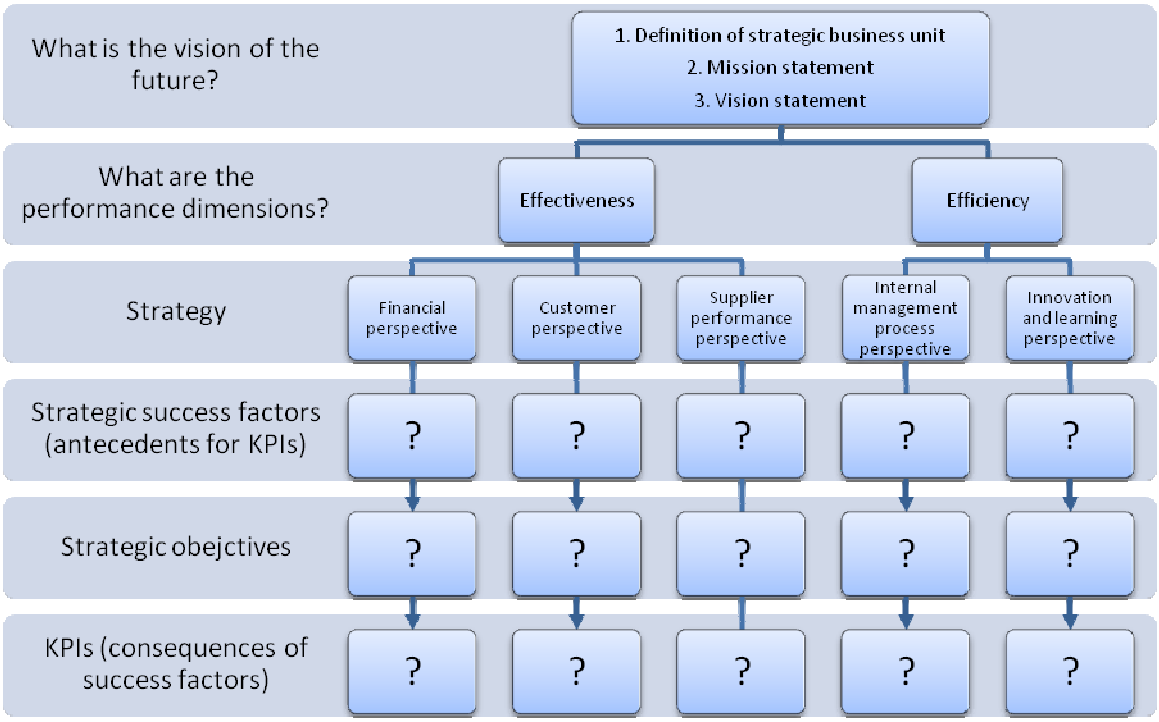

Figure 14. Procurement Balanced Scorecard implementation process. Own creation.

With the necessary adjustments, discussed before, the process of creating a balanced scorecard is assumed to be the most suitable option for the foundation of the procurement measurement model. However, it is probably impossible to expect that a theoretical balanced scorecard model will be covering all the existing issues of the procurement strategy, vision and mission.

Moreover, as the importance of the cause-effect relationships were mentioned before, they must be clearly identified in the case of procurement balanced scorecard. We are assuming that cause-effect relationships in procurement will be positioned in the procurement balanced scorecard on the same template of cause-effect relationships, identified by Kaplan & Norton (2001), which is presented in the picture below. However, the fifth perspective, related to supplier performance, was added to the primary balanced scorecard concept, thus the supplier perspective is also added when identifying the cause-effect relationships. Although it can be clearly assumed that supplier's performance is significantly affecting other perspectives of procurement, we are predicting that a cause-effect relationship exists between internal business processes and supplier performance. This assumed relationship will be discussed further, in order to explain the validity of such assumption.

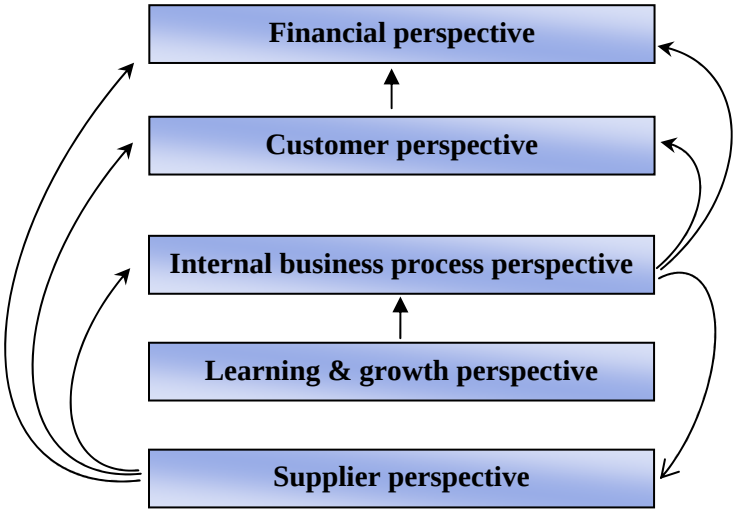

Figure 15. Cause-effect relations between different perspectives in procurement. Adapted from Kaplan and Norton, 2001

Saunders (1997, p.252) claims that supplier performance is influenced by the behavior of a customer (Internal business processes perspective in Figure 15). He says that the purchasing company is contributing to supplier performance by reflecting such things as the way that purchasing company is treating their suppliers and the expectations for suppliers.

Olson (2009) gives the examples of how the purchaser can positively influence supplier's performance. In relation to purchased material/product delivery, the improvement of supplier performance can be gained by giving the supplier insight into the supply needs and the production plan. Thus, the supplier can improve the level of service and lower logistics costs for both sides - purchasing company and itself. Additionally, defect deliveries would be avoided and the costs of the poor quality would be lowered of the purchasing company if mutual agreement is signed in advance.

Moreover, author suggests that in a long-term period supplier can be very beneficial for the purchaser due to its knowledge. If the supplier's knowledge and experience on the product and process engineering is introduced in the early stage of the development process, time to market and start-up costs may be reduced. Besides, while working in cooperation with the supplier, the possibility for ideas for improvement increases.

As Figure 15 shows, customer, internal business process and supplier perspectives are having an effect on financial perspective, which means that optimisation of firstly named

three perspectives can generate savings and increase profit for a company. Therefore, in the following sub-chapter we will analyse techniques related to different perspectives, which can optimise the financial performance.

4.4. Procurement Optimisation Techniques

We have already made important steps in building procurement measurement framework. The next stage of our research is to consider optimisation issues which we chose according to the measurement framework. In the following sections we are first going to discuss the financial benefits that procurement function can bring for the company and financial measures which can identify the financial results of procurement in the context of corporate finance.

Additionally, we discuss the techniques, which should be used in order to improve the performance of procurement and increase savings. The techniques that will be discussed are the following:

- *Optimized contracting, optimized cash flow and tendering process;*
- *Optimized supplier relationship management:*
  - *Relationship management;*
  - *Supplier segmentation, influencing the choice of the supplier and SRM;*
  - *Choice of the supplier – based on supplier segmentation, price and quality balance and other factors;*
  - *Understanding pricing model of supplier;*
  - *Optimised supplier quality control.*

4.4.1. Financial Measures

If considering the significant impact that the quality of procurement has on the overall company's performance and, most important, the bottom line, companies and organization are continuously seeking for ways to optimize the procurement process. In this chapter a literature review is provided in regard to the main strategies that have to be considered in order to improve procurement and achieve the best possible outcomes.

Ellram et al. (2002), while researching purchasing best practices, defined organizational success as the total return to shareholders. One of the widely used operating performance measures in the context of shareholder value is Economic Value Added (EVA) (Bacidore et al., 1997). EVA is calculated as follows (investopedia.com):

*EVA = net operating profit after taxes – capital*cost of capital*

In simple terms, EVA provides understanding, how much value a company has created or destroyed, in regard to the capital provided. It is very similar to another well-known financial measure, Return on Investment (ROI), providing the estimation of efficiency of an investment by comparing the profit earned and capital invested.

Due to its simplicity, the ROI measure can be easily applied for various calculations, however in the case of a purchasing department, the ROI is not that easy to calculate, as the department doesn't generate actual revenues itself. On the contrary, the procurement department itself represents the liabilities side of the corporate balance sheet, i.e. it generates not revenue, but expenses. Thus when calculating the profit, the procurement department's contribution to the profit is negative (profit =expenses – costs) – thus the high financial performance of the procurement department is equal to decreasing costs. However, as the expenditure is regulated by the extent of demand for products purchased, defined by all departments of the company, the only relevant financial measure, which truly represents the actual performance of the purchasing department is the financial savings generated. Thus, if calculating the ROI of procurement department, the savings should be taken into account instead of operating revenue generated. These assumptions are supported by the academic literature.

Pooler and Pooler (1997) suggests several factors, which are identifying the performance of a purchasing department, and among others, the financial measures include purchasing savings effectiveness and purchasing efficiency in terms of price. The target measures, which should be achieved in a purchasing department, as suggested by the Pooler & Pooler (1997), are the savings of 2% below previous pricing and reduced prices vs. market prices, in comparison to the base period. It must be noted that savings are calculated not only on a base of change in the price, but also savings should be calculated on a base of other value-adding factors, such as extended payment and warranty terms (improving the cash flow situation in the company), lowered transaction and administration costs and many others (Jones & Oliver, 2006, p.20-22). Moreover, the savings measure can be considered to show the performance of the department against the budget provided, i.e. it actually represents how much was spent outside of planned and budgeted spend. Normally, the expenditures outside the budget is targeted to be minimized, however certain unexpected conditions are quite usual in business, which can also justify higher than expected expenditure.

Target of increased savings is probably the most known tool for optimisation of financial performance of a procurement department. However, if ROI of procurement is calculated from a purely financial attitude, taking corporate finance as the starting point, the calculation can be done differently. The basic formula for calculating ROI is (Investopedia dictionary, 2009:

$$ROI = \frac{\text{Gain from investment} - \text{Cost of investment}}{\text{Cost of investment}}$$

If the calculation is done in the context of corporate finance, the gain of investment can be considered to be the income gained by the company, i.e. the income from sales. In this way, the money spent by procurement department as well as administration costs of the procurement department can be considered as a cost of investment. Thus, if it is necessary to apply the attitude of the top management, the profitability and ROI of procurement department can be calculated. However, the calculation using this method can be questioned, as the gain from investment in influenced to a great extent by other departments of the company, thus the calculation will have only guiding meaning due to its predicted inaccuracy.

The financial performance of the procurement department is significantly important due to its direct affect to the bottom line, thus it is one of the most important procurement optimisation directions and attracts the most attention from the top management. However, the financial performance shows only the result of the work done by the procurement department. Thus the managers directly related to procurement management should focus not only on the financial measures. The primary focus should be on the factors, influencing the financial performance measures of the procurement department, which consequently optimize the actual financial performance of a purchasing department.

To sum up, the financial performance of the purchasing department can be optimized through increased savings measures. The savings measures are representing the overall performance of the procurement department, and they can be optimized in terms of optimisation of price and other added-value factors. Some of the most important value-added factors, which are influencing the financial perspective of purchasing, will be introduced in the next sections. The choice of the factors for a discussion was based on

extensive review of literature of purchasing and supply chain management (e.g. Cavinato 2006).

4.4.2. Procurement Contracting Strategies

Well structured supply contracts and optimized management of the contracts is essential for having smooth procurement process as well as in order to ensure the effective choice of suppliers and their supplier relationship management. Moreover, compliance of the contracts is substantial as even if the best suppliers are chosen and they are managed well, maverick buying leads to significant defects in the procurement performance.

One of the essentials of the contract management is the choice of the right form for the contract. Firstly, the risk aversion must be considered when choosing the type of contract, i.e. the company must decide, what level of risk they are ready to take in a relationship with a particular supplier.

Moreover, the quality of the products and services of the supplier must be determined as well as it must be defined, how the quality will be measured. Surely, the products and services, provided by the suppliers, differ significantly – some of them are standard and thus it is easy to find measures for their quality. However, in more complex cases, such as clinical or educational services, the quality can be evaluated, however it is hard to define it clearly in the contract.

Finally, the future contract management costs must be considered as well. Depending on the type of the contract, the costs can differ for verifying the accounting data of the supplier, measuring different levels of quality standards, computing and enforcing penalties in case the supplier is not fulfilling his obligations, monitoring the compliance of the contract, etc.

One of the successful contracting strategies, widely applied in nowadays business is consolidation of the contract into one company-wide contract, instead of previously usual fragmented purchases (Juran and Godfrey, 1998, p. 215).

4.4.2.1. Impact on Cash Flow

The cash flow is one of the most crucial financial measures of a company and it can be significantly affected by the contracting strategy in procurement department. The statement of cash flow summarizes the cash flow from three sources: operations, investments and financing. The operating cash flow contains such parts as cash collection from sales, cash inputs into manufacturing or retail process, cash operating expenses, cash interest expenses, cash tax payment (Temte, 2004, p.77,90). On the one hand, the procurement department can affect the company's cash flow simply by lowering the expenditure. On the other hand, the payment conditions have a significant impact on the cash flow, as although the accounts payable are accounted as a liability in the balance sheet, the prolonged term from goods or services received to the actual payment enables increased amount of free cash flow at a certain time. Free cash flow is the amount of cash left over after the company has paid all the necessary expenses to maintain the current productive capacity. Free cash can then be used for other purposes, e.g. additional investments or decreasing the debt and subsequently the interest payment (Temte, 2004, p.103). Thus, prolonged payment term allows the company to maintain the productive capability; however the money can be used for other purposes.

4.4.2.2. Tendering Process

Dimitri et. al (2006, p.143) suggests, that the choice of tendering process is crucial as it determines the overall process of the procurement of a particular product or service. Mainly, the choice between internet auctions and the usual procurement process depends on the type of the item bought, the possibility to standardize the procurement process and specification for the item, whether the item is considered to be strategic or not, whether maintaining the exclusive relationship with the suppliers of this item is important or if the supplier can be easily replaced, etc.

4.4.3. Supplier Relationship Management Strategies

Although many different aspects must be considered while deciding a procurement strategy, the main issue, that usually get the most attention as well as is probably the most often mentioned in the academic literature is the supplier relationship management

strategies (SRM). Generally, the supplier relationship management, as the name itself identifies, is based on the interorganisational buyer-supplier relationship. Thus a great part of supplier relationship strategies are targeting the goal of building a successful and beneficial interorganisational relationship (Bozarth, 1998).

Generally, there are many aspects of supplier relationship management, which can be considered. However, in terms of optimisation, the factors, influencing the nature of supplier relationship management in each company, will be discussed further:

- Supplier segmentation
- Choice of the supplier
- Communication
- Approach to supplier base development

Moreover, quality management is as well one of the most important determinants of SRM (Trent, 2007, p.182), however due to its complexity and significance it will be discussed separately in a upcoming chapter dedicated to quality management in purchasing.

4.4.3.1. General Approach to SRM

There are three basic approaches that can be applied to the supplier relationship management (Bozarth, 1998):

- Mutual information exchange approach, contributing to the approach towards relationship management
- Choice between multiple sourcing and sourcing from one supplier, creating foundation to the supply base development strategy
- Decision to be engaged in formal contractual relationships with the suppliers or informal partnering relationships, contributing to the approach towards relationship management

Firstly, it is surely crucial to determine, to what extent and how the information will be shared with the supplier as well as what level of knowledge and information exchange will be expected from the supplier. Generally, the information exchange is necessary in order to achieve best results for both the supplier and the buyer. Firstly, the buyer must provide all information about its requirements, demand forecast and as well about any changes in

these factors, in order for supplier to be able to react accordingly. On the suppliers side, the transparency on the both current and expected future cost structure (both on overheads and raw materials), the quality and specifications of its products/services, the business model and any other valuable information (Bozarth, 1998)

Certainly, regarding the choice between single and multiple sourcing, there are pros and cons for both of the choices. While negotiating with several suppliers normally lead to lower-cost and/or higher quality products/services due to competition between the suppliers, the usual disadvantage of this process is the long time frame, necessary to close the negotiation and sign the contract.(Berger and Zeng, 2006). However, a tendency of negotiating with one or very few suppliers is arising, as the companies are targeting to get the same benefit from the long-term partnerships as in the multiple sourcing. (Berger and Zeng, 2006). In this case elimination of the excess allows the companies to concentrate on building effective relationships with the most suitable suppliers, i.e. the suppliers that are providing low-cost and high quality products. This supply base reduction strategy can be noticed more and more in the business world.)

Finally, the relationship with a supplier is usually based on contract basis due to uncertainty about the capabilities and reliability of the business partner. However, informal contracts can serve as a tool to show trust for the supplier, thus contributing to the development of the relationship. Thus, in some cases, the informal agreements can substitute formal contracts when the both parties are proving their reliability through time, providing a substantial foundation for trust (Ring and van de Ven, 1994).

As discussed before, the current procurement leaders are switching from the previous understanding of purchasing as a function, not adding value to the company to a more developed approach to purchasing as a strategic function. Based on the strategic approach towards purchasing, the main guidelines for supplier relationship management are cooperative partnership based on trust, long-term or indefinite length of the relationship, frequent communication with the supplier, with a focus on exchange of plans, ideas and problem-solving opportunities (Farmer & van Weele, 1995). The supplier base in suggested to be reduced to fewer suppliers which are carefully suggested, evaluated and managed (Juran & Godfrey, 1998, p. 216).

It can be noted, that previously mentioned directions of strategic purchasing have a significant effect on the information exchange, supply base development approaches as well as nature of the relationship with the supplier. Firstly, the relationship should be based on mutual transparency in terms of sharing the information. Also, in case of long-term relationships, although the contractual base of the relationship is still sustained, the most crucial focus should be on building sustainable informal partnering relationship. Surely, as identified before, the supply base strategy of strategic procurement is founded on progressing from multiple sourcing to sourcing from one or several suppliers for a particular material or service group.

4.4.3.2. Supplier Segmentation Strategies

As defined in the previous chapter, the three main aspects that must be taken into consideration when choosing the supplier relationship strategy are information exchange, multiple vs. single sourcing and choice of contractual relationship level. However, it is naturally assumed that a company or organization shouldn't blindly apply the suggested strategic procurement approach towards SRM, as it is of course only a guideline, not a rule. Thus different SRM strategies can be applied to different suppliers or material groups (Gelderman & Van Weele, 2005). In regard to these assumptions, it is necessary for a company to be able to properly evaluate its supply base or, in other words, to perform correct supplier segmentation.

The basic supplier segmentation model is dividing suppliers into two main groups (Dyer et al., 1998, Hoyt, Hug, 2000):

- Non-strategic suppliers, where the arm-length relationship strategy can be applied. The arm-length approach was the traditional approach, based on the objective to minimize dependency on a supplier by decreasing commitment and efforts for a relationship with a particular supplier
- Strategic suppliers, where the advanced relationship with the supplier is built. The importance of strategic supplier is recognized due to certain superiority that it has over the competitors, market conditions or specific factors of a company, e.g. necessity of a particular commodity that a particular supplier is providing, in order to ensure the functioning of a company.

The supplier segmentation is based on the strategy of the company as well as the product characteristics. There are two main SRM directions identified – arms-length relationships and strategic partnerships. Dyer et al., (1996) identified the main determinants for the choice between arm-length suppliers and core strategic suppliers, which are presented in table below. It can be noted, that the main determinant for the choice is the product characteristics.

	Durable arms-length relationships (Quasi markets)	**Strategic partnerships (Quasi hierarchies)**
Product characteristics	• Commodity/standardized products • Open architecture products • Stand alone (no or few interaction effects with other inputs) • Low degree of supplier-buyer interdependence • Low value inputs	• Customized, non-standard products • Close architecture products • Multiple interaction effects with other inputs • High degree of supplier-buyer interdependence • High value inputs
Supplier management practices	• Single functional interface(e.g. sales to purchasing) • Price benchmarking • Minimal assistance • Supplier performance can be easily contracted for ex ante • Contractual safeguards are sufficient to enforce agreements	• Multiple functional interfaces (e.g. engineering to engineering) • Capabilities benchmarking • Substantial assistance • Supplier performance on non-contractibles (i.e. innovation, quality, responsiveness) is important • Self-enforcing agreements are necessary (e.g. trust, stock ownership)

Figure 16. Comparison of durable arms-length relationships and strategic partnerships. Source: Dyer, 1996

Surely, one important factor that has influence on supplier segmentation is the actual nature of the company. Dyer et al. (1996) suggests, that the nature of the company in terms of what products they are using for manufacturing, has high influence on choosing the supplier relationship model. Generally, it is noticed that the companies, oriented towards buying procure products and services that have higher degree of added value and customization, are recommended to have more strategic suppliers. On the other hand, the companies, basing their manufacturing practices on supply of raw materials and other

goods that don't have high value added, are suggested to use arms-length relationships more often.

Moreover, Trent (2007) suggests that there are 4 categories of supplier relationships, named the four Cs, which are explained in the table below. These categories extensively explain the nature of the business relationship activities taken by both parties.

Counterproductive	**Competitive**	**Cooperative**	**Collaborative**
Also called antagonistic relationships	Also called adversarial relationships	Parties work together and share information	Congruence of goals exists
Parties work actively against needs of each others	Parties engage in competitive struggle over fixed value	Closer relationship as a result of mutual goals	Parties work together to create new business opportunities
Neither party takes responsibility of what happens in the relationship	Parties attempt to maximize value for their side	Supplier involvement increases	Parties work jointly to identify creative solutions to problems
Destructive conflict occurs	Minimal sharing of information		
Lose-Lose	Lose-Win	Win-Win	Win-Win

Figure 17. Categories of relationships with suppliers. Source: Trent, 2007

It can be understood, that the Counterproductive relationship is based on hostility from both parties and it should never be taken into account while considering the SRM strategy choice. The competitive relationship methods can be taken for the suppliers, which were identified to be suitable for the arms-length approach. If the strategic partnership is a target for the relationship model with a supplier, either cooperative or collaborative approaches should be taken, in order to ensure the win-win results for both parties as well as development of a sustainable long-term relationship.

Moreover, both cooperative and collaborative relationship models require further efforts in order to build crucial aspects, such as trust, sense of commitment, suitable communication patterns like early information sharing, early and continuous supplier involvement as well

as facilitate knowledge sharing, which are all essential for a beneficial relationship. (Mohr & Spekman, 1994, Monczka et al. 1993).

Considering the previous assumption, telling that the same procurement strategy does not necessarily have to be applied for all the suppliers, development of procurement models is recently gaining more and more attention. The procurement models are targeting at creating differentiated procurement and supplier relationship management strategies (Gelderman & Van Weele, 2003). Moreover, Gelderman & Van Weele (2005) proved that both the purchasing's position within the companies and as well the level of purchasing professionalism are directly related to increased application of purchasing models.

4.4.3.3. Choice of the Right Supplier

Generally, when choosing a supplier, four different measures, on which the supplier evaluation is based, should guide the process – price, quality, flexibility of production and delivery times (Peroni & Panciroli, 2002; Verma & Pullman, 1998). Surely, other aspects must be as well taken into consideration, such as supplier's competence, financial stability, supplier's organizational culture and potential for innovations (Goffin et al., 2006). Moreover, Monczka et al. (1993) suggests that one of the most important criteria for choosing a supplier is its capability to supply best-in-class performance to all buying units. The importance of this factor is incrementally increasing due to arising awareness of the benefits of Just-in-time (JIT) strategies.

Such situational factors as number of suppliers available, the importance of the purchase and/or the supplier relationship and the amount and nature of uncertainty present are emphasized by de Boer et al. (2001) as essential determinants of choice of the supplier. As well, the same author defines that a particular purchasing situation (e.g. modified rebuy, straight rebuy or new task) determines different criteria and methods used for the choice of the supplier. However, in this Master thesis we are focusing on more generic criteria for choice of the supplier, in order to fulfil the research objectives.

It is substantial to notice, that various researches of supplier selection criteria and methods were concluded that quality, cost and delivery performance were identified as three most important determinants for supplier selection and consequently the most important drivers of the supplier performance (Verma & Pullman, 1998, also mentioning studies of

Monczka, Wagner, Chapman and others). However, quality factor was ranked as the most important among others when choosing a supplier (Weber et al, 1991).

When choosing a supplier, Kraljic (1983) suggests to calculate the potential cost in case of non-delivery or inadequate quality. Obviously, the higher such costs as well the higher the risk of incurring them, the less likely is the solution of choosing a supplier, which cannot completely ensure that the exposure to such risk would be minimized.

4.4.3.4. Understanding Pricing

Surely, the price is one of the most important factors which are taken into account when choosing a supplier, although in many cases choosing the supplier, proposing the lowest price can be considered as short-sighted. There are several ways to evaluate the price that a supplier is suggesting, of which the common ones are benchmarking and evaluation of the supplier's pricing model.

Benchmarking the price, proposed by a supplier is generally a complicated tool, due to issues in finding a reliable and up-to-date source and ensuring the comparability of the data (Buchanan, 2008). However, if adequate resources are available, the benchmarking of the price can be a reasonable approach to generate a primary understanding if the price is reasonable or not (Jones & Oliver, 2006, p. 220).

Another way of evaluating, if the supplier's proposed price is reasonable, is understanding the pricing model of the supplier. Generally, the price and cost are two different terms in the context of pricing. Cost is the total of various individual costs involved in making a product or providing a service. However price consists of costs and the overheads, accounting for the cost incurred by the supplier in order to run the business as well as enabling the supplier to earn profit. (Jones & Oliver, 2006 p.60-62). It is common practice to ask the supplier to provide the cost information of the goods or services purchased, in order to conduct a cost price analysis (Jones & Oliver, 2006, p. 61). Moreover, the cost-price analysis is as well useful for further price renegotiation with the existing supplier. The information for the cost-price analysis is divided into several categories, which normally include variable costs, fixed costs and marginal costs. Through analysis of the supplier's price-setting strategy, a buyer gains significant knowledge for the supplier choice process, enables to differentiate the costs that add value to the product and costs

which don't and thus evaluate, if the price proposed is reasonable to pay for a particular product. Moreover, the price-cost analysis provides knowledge for measurement of changes in the price over time, which gives a foundation for negotiations and decision making. (Jones & Oliver, 2006, p.68)

4.4.3.5. Quality Control

There are 8 aspects, identified by the Saraph et al. (1989), which should be emphasized in order to achieve successful quality management: the role of management leadership and quality policy, role of the quality department, training, product/service design, supplier quality management, process management, quality data and reporting and employee relations. In the context of purchasing department, the biggest contribution to organizational quality management can be expected through supplier quality management.

The supplier quality management approach is clearly highly influenced by the high level procurement strategy. As the approach towards purchasing has evolved to a more complex understanding of purchasing as a strategic activity, the procurement department is not anymore focusing only on the price of the product supplied. On the contrary, strategically important aspects, such as quality, are taken into account. Thus, as the high level focus is brought towards quality, consequently the supplier quality management is gaining more significance.

There are many different definitions of quality, beginning with Crosby (1980, p.15) defining it as "conformity to requirements", Juran (1974, p. 22) characterizing quality as "fittnes for use", which incorporates such aspects as quality of design, quality of conformance, availability and adequate field service. In a more detailed level, Gavin's (1987) 8 quality dimensions are widely applied for explaining the multidimensional nature of quality. Lysons (2000, p. 176) reviewed Gavin's (1987) 8 dimensions of quality in the context of purchasing and claimed that the quality dimensions, most important for purchasing, are:

- Performance – product's operating characteristics
- Reliability – the probability of a product surviving over a specified period of time under stated conditions of use

- Conformance – the degree to which delivered products meet the predetermined standards
- Availability – the accessibility of the product
- Serviceability – the speed, accessibility and ease of repairing the item or having it repaired.

Thus the understanding of quality in the context of supplied products or services is defined by the previously mentioned Lysons' dimensions. Moreover, these dimensions create a guiding framework for optimisation of quality management in purchasing as well as helping to identify the required tools and strategies.

As discussed before, one of the core issues in purchasing is finding the right balance between price and quality. There are various approaches to quality, defined by Gavin (1984), however one approach is directly targeting the price and quality balance issue is purchasing, i.e. value-based approach. The value-based approach defines that the desirable quality is considered to be the one that provides required performance at an acceptable price or conformance to specifications at an acceptable cost.

After defining our approach towards quality in purchasing, we will further investigate the main optimisation tools, which facilitate the attempts to achieve the suitable approach for quality and price balance as well as ensure the correct supplier quality management activities.

There are several interrelated functions, defining the supplier quality control process (Farmer and van Weele, 1995, p. 118-119):

- Setting standards, based on different requirements, determined by the industry regulations, internal and external stakeholders, customer requirements. This function is presenting the performance dimension of the Lysons' quality dimensions.
- Assessment – creating a system, defining the way how the requirements should be realized. After setting the standards, it is important to investigate alternative ways to achieve the standards and evaluate, which ways are more beneficial in particular cases.

- Control – establishment of a system in order to check whether the standards are met. Control is a reactive system, summarizing the performance and providing data for improvement.
- Assurance – closely related to choice of the supplier, quality assurance function is targeting at keeping up the methods and procedures of quality control, i.e. systematically confirming the efficiency and soundness of the quality system by internal audit or external verification. Moreover, supplier quality assurance can integrate other quality control functions and additional activities, resulting in one complex system with a focus on preventing unacceptable quality products.

Farmer and van Weele (1995, p.123-125) claims that the supplier quality assurance programme is a significant component of supplier selection process; however it is continued afterwards as well. During the supplier selection process, preparing the purchase order specification is the primary step, defined according to detailed determination and assessment of the standards and requirements for a product or service. It is crucially important foundation for assuring the quality and it must be performed through close communication between the purchasing, manufacturing, R&D and possibly other departments. Next, the initial quality control activities occur, such as preliminary qualification of potential suppliers and inspection of the sample products. The preliminary qualification of suppliers usually is performed not only through evaluation of the information, provided by the supplier, but as well quality audit takes place through product audit, process audit and quality system audit. Quality audit can be either external or internal. If the external quality audit is chosen, the evaluation of ISO is considered to be most reliable, thus can be to some extent be trusted in the quality audit of the supplier. After the most suitable supplier is chosen, the optimized supplier quality assurance programme should include quality agreement, based on zero-defects objective. Afterwards, the concept of continuous quality improvement (also known as kaizen) should be implemented through periodical check of product and/or process variations.

As it can be noticed from the description of the supplier quality assurance programme, recommended by Farmer and van Weele (1995), the supplier selection extremely important for assuring quality in purchasing department. Establishing supplier selection criteria and process enhances communication and creates a foundation for developing a beneficial

partnership. (Vonderembse & Tracey, 1999). Thus, from the perspective of quality, successful supplier selection can surely lead to quality assurance and prevention of defects.

Lee et al. (2003) while designing a system for evaluation of supplier's quality for supplier selection, recommends to use 5 criteria when selecting a supplier, in order to assure the quality of products or services, based on the guidelines provided in ISO 9001 (ISO, 2000) quality appraisal results factors:

- Quality management system audit (weight 0,2)
- Product test (inspection) (weight 0,3)
- The percentage of workforce with a technical qualification (weight 0,1)
- Process capability index Cpk, calculating the process potential fo meeting the specifications [3] (weight 0,3)
- Annual number of hours per employee (weight 0,1).

It must be noticed that the Product test, process capability and quality management system audit factors have the highest weight, accounting for 0,8 in total. Thus, 80% of the supplier selection decision is suggested to be made according to these 3 factors, which can be clearly considered as the most important determinants of supplier's performance in quality.

[3] http://www.sqconline.com/cpk.html

4.5. Creation of Procurement Measurement Model

Until now we have adapted the most important ideas of the BSC method for procurement performance measurement (Figure 14) and talked about the most important techniques for procurement optimisation in general. However, there are still several issues left to be explained in order to complete the procurement measurement framework and to be able to use it as a tool for optimisation. As it was indicated before, procurement is affected by many factors and identification of the latter can be significant for successful performance of procurement. Therefore, in the following sections we will present main success factors (antecedents) as well as objectives and key performance indexes of different perspectives.

Moreover, a strategy of procurement function and consequently success factors, objectives and KPIs can be influenced by intervening variables, thus, it is very important to understand them and include them in the procurement performance measurement framework. Therefore, we identify moderating variables in Section 4.5.2.

Consequently, we integrate all the identified success factors, objectives and KPIs under different perspectives, also moderating variables in one framework and illustrate it in Section 4.5.3.

As it was proven before, balanced scorecard is one of the most advanced performance measurement frameworks, which by its structure and applicability is certainly useful as a foundation for building the procurement measurement model. One of the balanced scorecard elements is the so-called 'balanced scorecard map', consisting of the graphical presentation of the cause-effect relationships in a particular balanced scorecard as well as the hypothesis underlying these relationships. (Wagner & Kaufmann, 2004). The procurement measurement model is built on the same logic. In the context of perspectives, the strategy map describes how the intangible assets are transformed into tangible outcomes – customer satisfaction and financial benefits (Kaplan & Norton, 2000).

There are many ways that procurement system can be described, however, as defined before, we are focusing at presenting the most important strategic success factors, objectives and resulting procurement KPIs, in order to provide a relevant framework for implementation of balanced scorecard as performance optimisation tool. Moreover, as

discussed before, the procurement system and the relationships between its parts are not static – they are significantly moderated by certain factors and stakeholders, which in this case are defined to be moderating variables.

Extensive research has been done across academic and managerial literature as well as other managerial information available in order to find the success factors and KPIs, suggested to be used or already implemented in procurement functions of private companies. Surely, deliberate selection of the most relevant success factors and KPIs has been made, in order to ensure their validity. The SMART criteria, discussed before, have been applied for the selection process. The selected success factors and KPIs are presented below, sorted by different perspectives of the balanced scorecard, defined before.

4.5.1. Overview of Success Factors, Objectives and KPIs of Procurement Performance

Financial perspective

Success factor - Antecedent	***Objective - Consequence***	***KPI – consequence indicator***	***Comments***
Operating expenses management	Profitability and return on investment	Procurement ROI = procurement operating expenses/total sales	This KPI directly presents the return on investment in procurement from the top management perspective
Cash flow management	Increased free cash flow	Cash flow improvements = average number of payment days/number of suppliers	If the average number of payment days is increasing, it can be assumed that the free-cash flow is increasing
Cost management	Increased procurement savings	Procurement total savings = total annual savings/annual purchases	This is the one of the most crucial calculation, identifying the total savings achieved, thus evaluating the overall performance of the department

Figure 18. Financial procurement performance perspective. Source: own creation

Customer perspective

Success factor - Antecedent	*Objective - Consequence*	*KPI – consequence indicator*	*Comments*
Strategic management of procurement internal business process in regard to balance between price and quality	External customer satisfaction	Number of complaints regarding product quality from the final customer	There are many factors that influence the external customer satisfaction, however the complaints about quality can sometimes occur because of bad quality of production materials
Relationship management with internal customers	Internal customer satisfaction	Satisfaction survey feedback = % of stakeholders, satisfied with their supplier	The feedback on supplier performance is crucial, as it clearly shows the actual downsides, which might be not noticed by the procurement department

Figure 19. Customer perspective of procurement performance. Source: own creation

Internal business process perspective

Success factor - Antecedent	*Objective - Consequence*	*KPI – consequence indicator*	*Comments*
Increased collaboration with R&D deparment	Optimised material purchasing demand and specifications and consequent savings	R&D contribution = FTE[4] for R&D related projects	Depending on the industry, the purchasing department can significantly contribute to R&D by collaboration. The savings from R&D contribution can be as well calculated in order to evaluate the result of contribution; however it would need further considerations for the way of application, based on a particular case.
Human resource management	High productivity	Productivity = Procurement spend per employee	It is important to understand, if human resources are managed in the right way
E-procurement management	Savings achieved through e-procurement	Extent of e-procurement application = % of spend on e-procurement auctions in comparison to considered optimal %	In some industries, e-procurement auctions have proven to generate significant savings. However, the target shouldn't be continuously increasing % of spend, generated on e-procurement, as relationship with important strategic suppliers should be

[4] Full-time equivalent

			built individually
Order management	Shorter administrative lead time	Improvement in order management process = Change in administrative lead time in comparison to base period	This measure considers if improvements were made in order to shorten administrative lead time (time from Purchase Order (PO) to actual purchase), in comparison to the base period
Supplier relationship management	Improved supplier performance	Supplier relationship management improvements = savings achieved in regard to supplier relationship management optimisation	This measure considers both supply base development in a certain period and also guides the relationship management between different groups of suppliers
Contract management and compliance	Reduced maverick spend	Maverick spend = % of spend outside the preferred contracts/purchasing spend	It is important to know, how much money is spent outside the existing preferred contracts, as this usually means worse purchasing conditions
Outsourcing	Increased outsourcing of procurement processes?	Extent of outsourcing = % of managed procurement spend outsourced	If outsourcing is a key element of the company's strategy, then this measure is highly valid

Figure 20. Internal business process perspective of procurement performance. Source: own creation

Learning & growth perspective

Success factor - Antecedent	***Objective - Consequence***	***KPI – consequence indicator***	***Comments***
Investment in development of skills of employees	Employee competence improvement	Extent of training = employee training hours/employee	Employee development is very important in order to ensure success in achieving other success factors

Figure 21. Learning and growth perspective of procurement performance. Source: own creation

Supplier perspective

Success factor - Antecedent	***Objective - Consequence***	***KPI – consequence indicator***	***Comments***
Supplier Relationship Management	Zero of delayed deliveries	Delay quota = % of delayed deliveries	It is very important to ensure, that the delivery is not delayed, especially in case of Just-In-Time strategy
Quality management	Zero defects in supplied materials	Number of defects = Number of quality/specifications complaints from internal customers	This measure considers the defected/unacceptable products received from the supplier
Analysis of supplier's pricing strategy	Reduced prices	Price development = Benchmarking on price or % of savings in terms of price	This factor can be measure either by benchmarking the price (if relevant), otherwise it can be supplemented by calculating savings on the base of price
Supplier Relationship Management	Improved supplier service	Satisfaction survey feedback = % of stakeholders, satisfied with the supplier	Measures both purchasing department's and internal customers' satisfaction in terms of accessibility and responsiveness. This measure can be joint with the internal customer satisfaction measure
Supplier Relationship Management	Increased supplier's contribution to R&D	Suppliers' R&D contribution = Number of R&D projects, where suppliers are involved	In some industries, the supplier can significantly contribute to the R&D of the company. The savings from supplier's R&D contribution can be as well calculated in order to evaluate the result of contribution; however it would need further considerations for the way of application, based on a particular case.

Figure 22. Supplier perspective of procurement performance. Source: own creation

4.5.2. Moderating Variables

The moderating variables are factors, influencing the choice of the strategic procurement objectives.

Industry. While measuring the procurement performance, attention should be paid that some of the measurement factors are different between various industries. In building the purchasing performance measurement models for benchmarking, CAPS differentiates the industries and establishes measurement criteria for each industry individually (Easton et al., 2002). We are going to examine two industries and verify or deny that there are significant differences in measuring the procurement performance in different industries.

Service vs. manufacturing business model. As discussed before, Gebauer, et al. (1998) and Van Weele, (2002) identified 4 groups of purchased materials. Moreover, it is clear that the procurement performance and optimisation directions are highly dependent on the nature of product supplied. For example, different supplier relationship management strategies could be applied for suppliers of different products based on their architecture and significance. Moreover, companies applying service-based business model are going to procure totally different groups of products (e.g. indirect materials could be much more important in service-based companies) than manufacturing companies, where, as Gebauer (1998) claims, raw materials are the primary strategic purchasing focus. Consequently, the fact that a company business model is based on services or manufacturing will have high influence for procurement performance measurement system as well as optimisation directions.

Ownership form of the organisation (public or private procurement). Depending on the ownership form of the organisation, the antecedents and the consequences in procurement performance measurement will differ. This is due to fundamental difference in the strategic goals of public organisations and the organisations in the private sector (Murray, 2001), as well as higher regulations and political constrains in procurement in public sector (Lian and Laing, 2004). The objectives of private sector are also different from the ones of public sector, especially local government. One of the main reasons for this distinction is the huge importance of ethical issues of the use of public‘s money in public procurement

(Kestenbaum and Straight, 1995). The objectives of the procurement are the basis for the measurement of its performance, therefore, the same methods for procurement performance measurement in public and private sectors cannot be applied.

The examples of the variations in procurement objectives can be the number of suppliers – the private companies are seeking to reduce the number of suppliers, whereas public entities are aiming at creating full and open competition (Kestenbaum and Straight, 1995). Additionally, such purchasing objectives as cost reduction, quality improvement, innovation transfer and security of supply are most important in private organisations, while local government – one of the public sector areas - is focusing on local economic development, environmental management, quality of life, cost reduction, quality improvement, sustainable development and others (Murray, 2001).

4.5.3. Procurement Measurement Model

Based on the assumptions, provided earlier as the motivation for the choice of the most important objectives and KPIs, we are building the procurement measurement model. However, the assumptions which we have, are based mostly on interpretation of the SMART criteria as well as interpretation of the crucial strategic objectives of a procurement department. Thus, as interpretation is a subjective tool for finding the most important KPIs, our assumptions must be tested. However, as mentioned before, one of the main moderating variables is the industry and clearly it can be expected that, depending on the nature and regulations and requirements for a particular industry, the strategic success factors as well as the tolls to achieve them and consequently the KPIs should be different. Thus now we provide only the generic procurement measurement model, shown in the picture below.

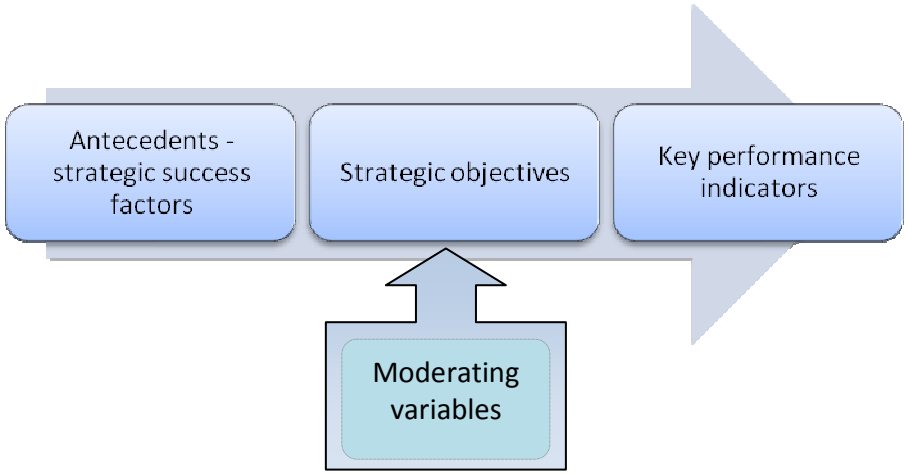

Figure 23. Logic for procurement performance research. Source: own creation

The generic model, presented above, explains the logic of the procurement measurement model. Figure below systemizes our theoretical discussion which was built until now and illustrates the results – full procurement measurement model is presented, including the chosen success factors, strategic objectives and related key performance indicators as well as moderating variables.

Figure 24. Procurement performance measurement model. Source: own creation

Previously, in chapter *4.3 Implementation directions for Procurement Performance Measurement* the abstract model for procurement performance measurement was built, which illustrated the major ideas of balanced scorecard applied for procurement department. Five perspectives were named (Supplier, Internal business process, Learn and growth, Customer and Financial), which are also illustrated in Figure 24. All of them are closely related and they affect the performance of each other.

In addition, in chapter *4.5. Procurement Optimisation Techniques* the most important and influential procurement optimisation strategies were discussed. As a result, this information was applied while formulating the main success factors (antecedents) objectives (consequences) and their measures (KPIs) for procurement performance. The orientation towards execution of success factors enables implementation of the named objectives, the achievement of which can be measured by using the key performance indexes. All of the main variables are named in Figure above and grouped according to success factors' dependency for certain perspective.

It was mentioned in section *4.5.3. Adjustment of Balanced Scorecard for Procurement* about the existence of influence between different perspectives. This influence can be clearly seen in Figure 15 and Section 4.5.1. The techniques, called *Success factors*, belonging to one perspective, can help to fulfil objectives, set for another perspective. For example, supplier relationship management implemented by internal business process is a mean to improve an objective of supplier performance, which is related to supplier perspective. Similarly, contract management and compliance implemented by internal processes leads towards reduced maverick spend which reflects financial performance.

In addition to mentioned factors and variables, which are composing the framework, the crucial elements to mention are moderating variables. These variables are making an influence on procurement strategy and vision formulation, consequently, affect the objectives. The moderating variables in our case are industry, ownership form and the type of the company – whether it provides services or manufactures the products. According to the assumptions made about these moderating variables, we have chosen to further investigate only manufacturing companies in pharmaceutical industry in order to make implications and test the composed measurement framework in practice. This is done in next chapters.

To conclude, we have answered the first question, identified in the problem formulation:

- Which factors can be named as procurement success factors, objectives and what are relevant performance measures? What are the variables, moderating them? What are relationships existing in the procurement system?

In the procurement measurement model, presented above, we are presenting the identified procurement success factors, objectives and relevant performance measures. Moreover, we have found out, which are the influential moderating variables, adjusting the procurement measurement model and its application. The relationships between different perspectives were well extensively discussed in the previous chapters and as well some of them are presented in the fig. 24.

5. Procurement Measurement Model in Pharmaceutical Industry

5.1. Characteristics of Procurement in Pharmaceutical Industry

Considering the volume of European pharmaceutical industry, in 2007, European companies have reached 31,1% of world pharmaceutical sales in comparison to 45,9% of companies from North America (EFPIA, 2009). A strong development of pharmaceutical industry is especially crucial for society, as pharmaceutical treatment significantly contributes to an increase of length of humans' lives and quality of life. Today's scientific knowledge and modern technologies are necessary means for improving present medical treatment and developing new pharmaceuticals, especially for at present incurable diseases (e.g. Alzeheimer, multiple sclerosis, cancer and orphan diseases). Thus, pharmaceutical organizations in different countries (particularly in North America, Europe and some regions in Asia) are heavily investing in research and development function. Between 1990 and 2008, R&D investment in United States grew by 5,6 times whilst in Europe it only grew by 3,5 times.According to data from IMS Health, 66% of sales of new medicines launched during the period 2004-2008 were on the US market, compared with 26% on the European market Among others, the pharmaceutical industry although relatively small, with around 635 mill. people employed in European pharmaceutical industry in 2007, it is generating remarkable revenues and thus achieves impressive performance – around 190 mill. euros in 2007. [5]

The main production directions in the pharmaceutical industry can be divided into two categories (Farmer &Van Weele, 1995, p. 524):

- Products sold over the counter. These products are well known for each person – they are simple remedies for self-medication.

- Products sold only against prescriptions from a medical practitioner. This category

[5] EFPIA (2009) The pharmaceutical industry in figures. Key data, 2009 update. Belgium

of medicines is the ones which account for high expenditures for R&D in the pharmaceutical industry. Surely, this category of products is as well generating the most of the revenue.

There are several determinants which show, how complex pharmaceutical manufacturing process is, in comparison to other industries (Ijioui et al. 2007, p.13-14):

- The production process in chemical production can last from six months to 2 years, depending on the number of synthesis steps. Chemical/microbiological synthesis produces active ingredient for a drug and the starting material for further chemical/microbiological synthesis

- The expansion of production capacities is hardly ever possible in less than four to five years

Farmer & Van Weele, (1995, p.524) defines the main issues, related to purchasing in pharmaceutical industry, to be as follows:

- Extensive and expensive, legally-enforceable, manufacturing practices
- Restriction of selling prices of ethical (or prescription only) products
- Long and expensive periods of time to develop safe products
- Short product life
- Patent infringements, especially from overseas manufacturers
- Control in advertising its products

The pharmaceutical industry at present is experiencing significant change. Whereas recently drug industry was on the rise – enjoying plentiful revenues, now number of challenges has to be faced: demands of global competition, necessity of speeding up the drug-development process and the pressure from the European Medicines Agency (EMEA) to supplement the process and analytical development with new, scientifically based, more statistically rigorous and risk-based approaches to quality and compliance (Peterson, 2009). Additionally, the financial issues became very relevant due to the following problems.

Shareholders are sceptical about the generated cash of big pharmaceutical companies (e.g.

Pfizer, Merck, Novartis). Investors are rather interested in short term returns. Before seen as strong growth stocks, offering safety and steady future expansion for the investors, in recent years the shares of drug companies had low performance in comparison with other industries. (Jack, 2008) The reasons are related to the increasing pressure on pricing, threatening of the sales of existing drugs, and replacements in the pipelines are limited.

The most concerning issue for the drug manufacturing companies is the expiration of the patents on existing medicines in several next years, reducing the industry's collective annual revenues by around €70bn (Jack, 2008).

Additionally, the economical situation in the market is not favourable. Thus pharmaceutical companies are struggling in finding most lucrative ways to survive the competition - beginning with extreme cost cutting initiatives, resulting in thousands of people made redundant, as well as efforts to unleash scientific talent from managerial bureaucracy and making significant investments into research activities, in order to boost the development of new medicines.

There are three main groups of products, supplied for pharmaceutical manufacturing (Farmer &Van Weele, 1995, p. 526):

- Synthetic materials – mostly derivatives of petrochemicals. This group of purchased products defines the fact that pharmaceutical industry is much influenced by the petrochemicals industry, thus knowledge about the petrochemicals is essential for successful purchasing for pharmaceutical industry. Moreover, due to complexity and dynamics in the chemicals industry, it is essential to develop close relationships with the suppliers of the synthetic materials, targeting to gain facilities, required for successful purchasing in pharmaceutical industry, which should be provided by the supplier – related to areas such as quality control and specific warehousing possibilities.

- Natural materials – widely applied in the pharmaceutical manufacturing, beginning with such well known products as sugar as well as other more complex products, such as colouring materials. The increasingly common practice of purchasing natural materials is direct communication with the producers, while eliminating the need for the merchant's service. However, the production of natural materials is to

large extent defined by lack of quality control, thus additional efforts must be made from the purchaser's side in order to ensure that the product is suitable for pharmaceutical manufacturing. The main determinant of the natural materials, apart from wide variety of international suppliers, is that the prices of many natural materials are highly influenced by the CAP (common Agricultural Poilicy) of EU. Surely, suppliers outside EU can be chosen, however the quality issue arises when buying form suppliers outside EU.

- Packaging materials – the main packaging material used for pharmaceutical industry is plastic containers. The market for of plastic packaging suppliers is defined by large number of international suppliers. Moreover, possibilities for innovative solutions for packaging are arising in the market – they must be followed and recommended for application by the purchasing departments.

One of the main determinants of purchasing in the pharmaceutical industry is the unavoidable concern about the quality of the products bought. It cannot be overemphasized, as the impact of the final product on customer's health defines the importance of the necessity for impeccable quality.

Surely, the manufacturing process in the pharmaceutical industry is strictly regulated by the authorities. Firstly, in order to gain a production licence for medicines, the detailed information about the raw materials must be supplied. Due to these requirements, the extensive product information must be provided by the supplier. However, many suppliers are not willing to go through the trouble to provide these descriptions, especially in the cases when the buyer is only one among thousands of other buyers and accounts only for small amount of the revenue. However, the purchasers for pharmaceutical manufacturing must ensure that detailed product information is gained from the supplier, in order to contribute to ensuring the product quality. Moreover, the quality concerns are applicable not only to the suppliers of chemicals and other materials, directly used in the production of the medicine, but as well the quality of packaging material (e.g. PVC for making plastic bottles) must be strictly validated (Farmer &Van Weele, 1995, p. 526).

Generally, the pharma market varies from other due to the fact that the patent-protected drugs cannot be substituted in case of bottlenecks in supply, thus resulting in losing the trust of the customer and decreasing customer satisfaction for a very long time, as well as

in the cases of particular diseases, it can be life threatening for a customer if there are bottlenecks in the drug supply. Also, the demand of the drugs can be arise extremely quickly and unpredictably, for example in case of a pandemic or flu and the drugs must be available in the market on very short notice.

Although not much research has been made regarding purchasing in the pharmaceutical industry, a survey made by D. Hatherall [6] showed that the vendor selection process is based on several criteria, noted further in the order of priority: quality, price, service, technical capability, financial strength, geographical location, reputation and reciprocal agreements. Moreover, a case study of a pharmaceutical manufacturer Baxter, conducted by Suarez Bello(2003) identified that there were 3 measures, used for supplier performance evaluation and supplier selection: quality (weight 50%), delivery (40%), service (10%). As suggested by author, quality is the highest focus for supplier performance in pharmaceutical industry, as the impact of the final customer's health is above all other factors. Moreover, the Baxter case study identified that a standardized supplier selection and evaluation process was implemented. We assume that this choice was made due to the particular requirements in supplier selection process in pharmaceutical industry, as the impact of supplier is highly recognized.

5.2. Procurement Model Application in Pharmaceutical Industry – Hypotheses' Building

After reviewing the pharmaceutical market, its most important challenges and purchasing aspects, we are going to investigate it further by applying the theoretical knowledge, presented in the previous chapters. Firstly, we identified the different perspectives, success factors, objectives and their indicators for the procurement performance. Also, we claimed that supplier performance is the most important procurement performance driver. We are going to apply this theoretical knowledge for the pharmaceutical industry by developing

[6] Hatherall DA (1988). Purchasing in the pharmaceutical indus-try. Unpublished M. Phil. Thesis, Department of Management Science, Lancaster University, UK., mentioned in S. Yahya and B. Kingsman (1999) Vendor Rating for an Entrepreneur Development Programme: A Case Study Using the Analytic Hierarchy Process Method, Vol. 50, No. 9

specific hypotheses and testing them using a questionnaire. The hypotheses and their theoretical development are presented in detail in this chapter.

Firstly, when discussing the moderating variables of the model, industry was mentioned as one of the most important moderating factors. Thus if relevant, we incorporate the specific aspects of purchasing for pharmaceutical manufacturing into application of the theoretical considerations. A more extensive discussion will be provided further, when the development of the hypotheses is described.

After the theoretical discussion about procurement performance, we reached a conclusion that the supplier performance is the most important procurement performance driver. We are going to apply this conclusion to the empirical analysis by using it as a foundation for developing the other hypotheses. We will further investigate the nature of the supplier performance in a comprehensive way.

As defined in the problem formulation section of the Master thesis, in the empirical part of the master thesis we are focusing on answering these questions:

Are the provided theoretical assumptions valid in practical business, particularly in pharmaceutical industry? What is the most important procurement success factor, its objective and optimisation tools in regard to production material procurement performance optimisation in pharmaceutical manufacturing companies?

In regard to the theoretical procurement measurement model, presented in Section 4.5.3, we are going to apply knowledge of two procurement perspectives – supplier perspective and internal business process perspective. It is important to notice that supplier perspective presents the supplier's performance and internal business process perspective shows the internal tools that procurement department can use in order to influence the supplier's performance. This relation is presented in the figure below.

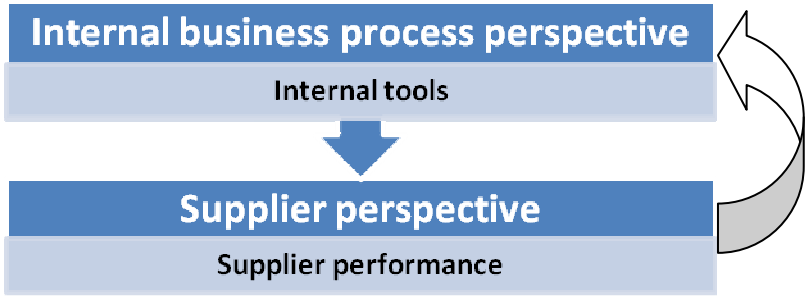

Figure 25. Impact of internal tools on supplier's performance. Source: own creation

Moreover, the theoretical procurement model was based on the the logic of antecedent – consequence (or success factor – objective). We apply the same logic for the process of building the hypotheses by investigating:

- Which is the most important supplier performance success factor? What should be objective for this success factor?
- What tools should be used in order to achieve the objective for the most important supplier performance success factor?

To sum up, the first step of hypothesis development is the limitation of empirical research to supplier performance as an important procurement performance driver. Further, develop two main questions that the hypotheses would help to answer:

- What should be optimised in supplier's performance in pharmaceutical industry? How these areas should be optimised?

For researching the first question and finding what are the most important procurement optimisation area and its objective, we use the same antecedent-consequence (success factor – objective) logic as in the development of the theoretical procurement model. Thus, we are looking for the most important success factor for supplier performance and the most important objective for this success factor. Moreover, on the same sequence as in the theoretical part, after identifying the most important success factor and its objective, we aim at finding out what tools should be used in order to optimise the area of the most important success factor. The summarized hypothesis development logic is presented in Fig.... below.

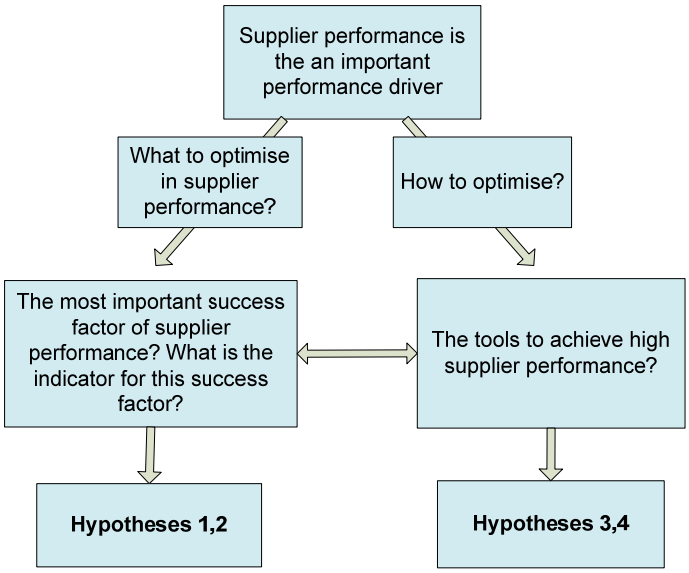

Figure 26. Logic of hypothesis development. Source: own creation

5.2.1. Main Procurement Success Factor in Pharmaceutical Industry

In this chapter we will try to provide the justification for the statement that supplier performance is the most important procurement performance driver in pharmaceutical industry. As well we will create hypotheses answering the question, what should be optimised in supplier's performance in pharmaceutical industry. We will investigate the optimisation of supplier's performance by predicting the most important success factor in supplier's performance and what should be the objective for this success factor.

Chaffey (E-Marketing Glossary, 2009) describes a performance driver as[7]:

Critical success factors that determine whether business objectives are achieved.

According to the description, a performance driver is a set of success factors which are directly linked to the objectives. As discussed in the theoretical section of the master thesis, although all perspectives of procurement performance are important, however the supplier performance is the primary performance driver. Thus the set of success factors, directly related to the supplier performance, is of crucial significance. This assumption arises from analysis of the relationships between the different perspectives. It can be noticed that the supplier performance is a cause for internal business process, customer and financial perspectives. High supplier performance is as well the main strategic target of each

[7] http://www.davechaffey.com/E-marketing-Glossary/Performance-drivers.htm

procurement department. Depending on the particular company's strategy, the procurement department is aiming at assuring that the suppliers are able to perform in the desired way as well as that they are in fact performing in the desired way. Thus the other perspectives of the procurement performance can be reckoned as either tools for achieving supplier's performance or results of supplier performance. For example, the internal business process perspective present tools for achieving high supplier performance. On the other hand, customer perspective is directly affected by the supplier performance as the customer satisfaction is high when the suppliers are performing as required by the customers and on the contrary both internal and external customers might be dissatisfied when their needs are not met by the suppliers. The learning and growth perspective as well consist of tools, increasing the competence of the employees thus helping to achieve internal business process objectives and consequently enabling the procurement department to better influence the supplier's performance. Finally, the financial perspective presents the financial results of the procurement department, which can be in practice only improved by achieving higher supplier performance. Thus even if some measures in the internal business process or learning and growth perspectives are improved, they only are valid when the supplier's performance is positively influenced by these improvements. Moreover, only by improving the supplier's performance, the customer satisfaction or financial results can be upgraded. Thus, it is clear that the primary goal and task of procurement department is to ensure that the suppliers are meeting the expectations and requirements of the company, i.e. to ensure high performance. Thus we are concluding that supplier performance is an important procurement performance driver.

As discussed before, a performance driver consists of different success factors, and in this case the supplier performance as well consists of 5 success factors: reliability of delivery, material quality, supplier's service quality (e.g. flexibility, responsiveness or availability), prices and ability to contribute to buyer's R&D.

As well in practice, while developing a strategy and its measures, the next step after identifying the performance driver is setting finding the focus area for this performance driver. The focus area is presented by the different success factors, which, depending on a particular situation, can have higher or lower strategic importance.

In the case of procurement department, we assume that the focus direction for the supplier performance optimisation strategy should be highly dependent on the industry moderating variable. This assumption arises from the issue of finding a balance between price, quality, delivery and other benefits that the supplier can provide. Surely, depending on the strategy of a particular company, the focus can be different – some companies, targeting at low-income customers, will prefer a supplier suggesting the lowest price. Others, implementing Just-In-Time strategy, will focus on the delivery terms.

As discussed before, pharmaceutical manufacturing is highly focused towards quality due to regulations, impact on customer health and other factors. As discussed before, D. Hatherall (1988) successfully claimed that quality is the most relevant factor when choosing a supplier. Thus, the primary goal of supplier performance optimisation should as well be related to maximizing the quality of the products provided. Thus, we are creating a hypothesis, stating:

H1 – *The material quality is the most important success factor in order to achieve high supplier performance.*

Surely, as the Key Performance indicators are a direct reflection of the strategic objectives, the choice of the KPIs in the pharmaceutical industry will be considered to be the same as the choice of the objectives.

As we claimed earlier that quality is the most important supplier performance success factor for pharmaceutical manufacturing suppliers, it is reasonable to search for the ways to indicate that a supplier would provide a required quality product and to understand, how the quality of different supplies should be evaluated in the pharmaceutical industry. As defined in the theoretical section of the Master thesis, Lee et al (2003) suggests that the quality appraisal tools, having the most weight for decision-making, are product test and process capability index, followed by quality management system audit. Surely, the quality management system audit results, such as acquired ISO certifications, are a significant proof of supplier's product quality; it should be taken into consideration only as a guiding factor, not as a factor, which provides undeniable information. It must be clear, that having a certificate doesn't necessarily ensure everyday quality in each part of the process. Although the process capability index is highly relevant measure, it as well provides certain issues – beginning with the supplier's willingness to share such sensitive

information about its business as well as entails a question if the measures of the quality management system actually represent the actual production capabilities. Moreover, testing the product samples create possibilities for improvements, if the any defects or disadvantages were identified in the first product sample. However, if the actual product is provided for testing, it is much easier and more accurate to evaluate the product's quality by simply testing the sample according to the certain predetermined requirements. Thus, we are assuming that results of testing provided product samples should be the most important determinant of the supplier material quality, when choosing a new supplier:

H2 – Product testing results are the most important indicators of material quality within the pharmaceutical industry.

5.2.2. Procurement Optimisation Tools and Methodologies in Pharmaceutical Industry

In this section we will try to find an answer for the third question regarding the relevant optimisation tools and methodologies for supplier performance in pharmaceutical industry.

After defining the main success factor and its objective for supplier's performance, we as well identify the tools that would ensure that objectives for the quality success factor as would be achieved. According to the identified relationships between different performance perspectives and overview of performance measures for procurement department, it is clear that the "Internal business process" perspective consists of the tools, directly affecting the supplier's performance.

Although all of the success factors in the "Internal business process" perspective are important, we assume that Supplier relationship management success factor is the most important as it is a crucial foundation, defining the relationship with the supplier. After all, even if all other aspects of the internal procurement process are impeccable as well as generally the supplier has good performance records in the market, the actual supplier performance can be discouraged and even limited due to choice of a irrelevant communication strategy - for example acting openly opportunistically, showing unwillingness to collaborate and share information. In the context of pharmaceutical industry, the importance of supplier relationship management can surely be emphasized as

one of the most effective tools. For example, Philippart (2009) in the "Review of evolution of procurement in the pharmaceutical industry" emphasized the importance of collaborative relationship with the suppliers as a key aspect of strategic procurement in pharmaceutical industry and claims that collaboration aspect of supplier relationship management builds foundation for sustainable value creation.

Thus, we are assuming that:

H3 – Supplier relationship management practices are the most effective tools for achieving high procurement performance within the pharmaceutical industry.

Moreover, it is important to notice that supplier relationship management includes not only communication-related tools, such as building sustainable relationship through trust building, but as well includes many more tools and methodologies which can be used in order to assure that both high supplier performance as well as efficient approach towards the suppliers, ensuring the optimal use of the resources. Our understanding of supplier relationship management and its components is presented in the Fig…. below.

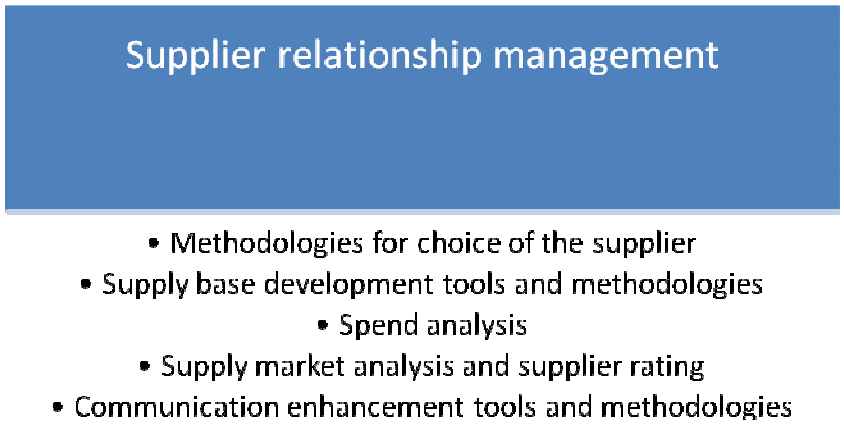

Figure 27. Supplier relationship management components. Source: own creation

Finally, as we discussed several aspects of the supplier relationship management, it is as well important to understand what approach should be taken towards the relationship with the supplier after the choice of the supplier. As discussed in the theoretical section of procurement optimisation strategies, the choice of relationship model depends on the characteristics of the products supplied. As defined before, there are 3 main groups of supplied products for pharmaceutical manufacturing: synthetic, natural and packaging materials. They can surely be described as non standard products, having multiple

interaction effects with other inputs as well as the supplier-buyer interdependence is relatively high. Thus, we are assuming that a generic tendency of supplier relationship models in pharmaceutical industry should be long-term relationships. Moreover, the certain relationship benefits, crucial for pharmaceutical industry, such as knowledge sharing, supplier's contribution to R&D, mutual understanding and goals and others should be very important for the procurement departments, buying raw materials for pharmaceutical manufacturing. Thus we are building a hypothesis:

H4 -Long term relationship is the most important objective of optimized supplier relationship management

In order to enable testing in pharmaceutical industry, the procurement measurement model has been updated according to the hypotheses developed and is presented in the picture below.

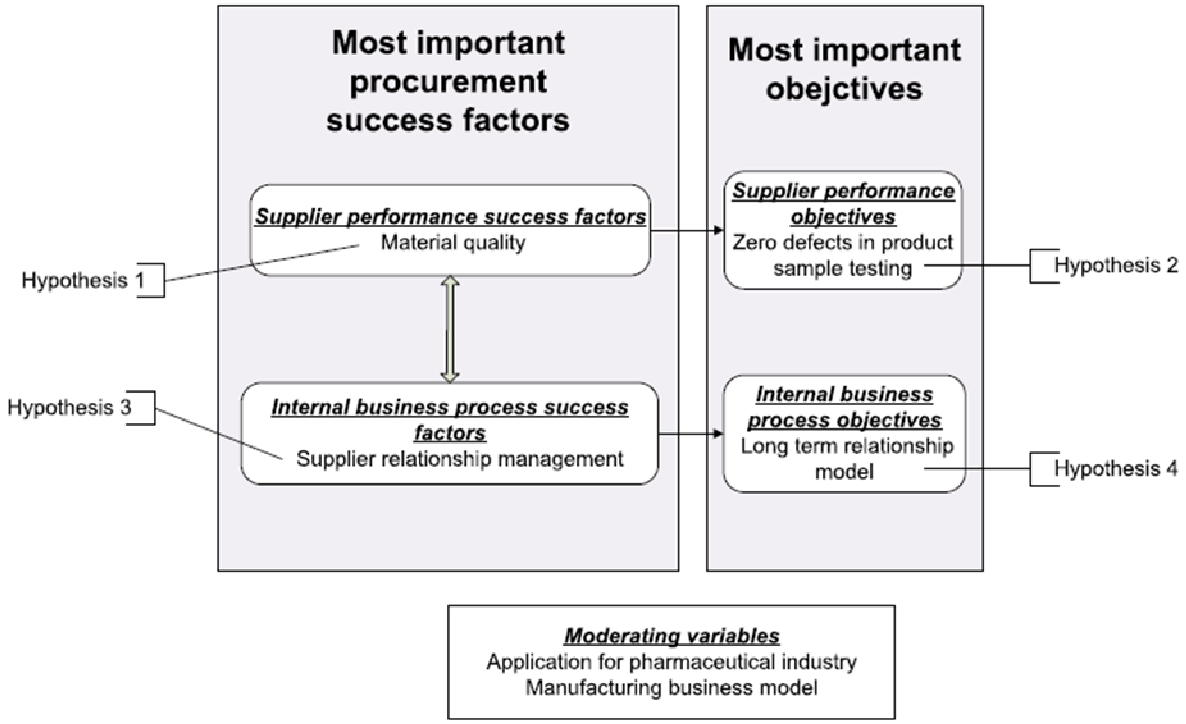

Figure 28. Application of supplier perspective of procurement measurement model for pharmaceutical industry. Source: own creation

6. Empirical Analysis

6.1. Population and Sample

In sample determination, the population is also important. The "universe" of our population can be described as all procurement departments of large and medium size European pharmaceutical manufacturing companies. It is impossible to state the exact number which would determine this population. Therefore, our aim was to create as big sample as possible. We have named in Chapter 3.3. the methods which we used to compose the sample. Using the second method, we have contacted around 40 companies by email to ask to provide contacts of needed employees. 4 contact emails were received and after sending out the questionnaire, 2 questionnaires were filled in.

Furthermore, we have tried to contact approximately 90 companies by phone, and later we have sent around 160 e-mails to general information e-mails of the companies, with the links to the survey. The final result was 22 received questionnaires. However, 1 of them was rejected due to not suitable work responsibilities of the respondent, as well as 3 more responses were rejected because questionnaires were not fully answered. To generalize, we managed to collect 18 questionnaires which are suitable for the analysis. As it was mentioned in chapter *3.3. Research Methods and Techniques*, we are using these questionnaires for a pilot survey. Thus we consider answers from 18 respondents to be sufficient in order to make valid and reliable conclusion for a pilot study and as well develop recommendations for further research and practical implications.

Testing Hypotheses

The empirical analysis consists of two sets of data:

- Data, used for hypothesis testing - multi-item data (in order to test a hypothesis, we are using data from more than 1 question in the questionnaire) – used to test hypotheses 1,2,3,4.
- Data, used for further guidance of recommendations

Firstly, we are going to analyze the data, used for testing the hypothesis. We divided the survey data into different groups, in order to create structure for hypothesis testing. Thus, the empirical analysis section is as well divided into 4 parts, corresponding to the 6 hypotheses at we had. The structure of each empirical analysis for each hypothesis consists of following parts:

- Descriptive overview of the data
- Scheffe test , helping to identify existing (if any) significant differences between the variables (Acton 2009, p. 187) It must be noted that in order to test the hypothesis, we are fabricating one additional variable, which is included in Scheffe test and Proximity matrixes (which will be discussed in detail later). This variable represents the assumed case that all respondents expressed that a particular variable is of highest importance for them, i.e. marked a score of 5.[8]. For the sake of clarity, we call this variable "Best case" and the variables, generated from the survey data, are called "Real" variables. According to the nature of the hypothesis, we are searching for variables, which don't differ significantly from the "Best case" fabricated variable (hypotheses 2, 3, 4, 5). While testing hypotheses 2,3,4,5, we are searching proof of differences between the variables and the "Best case" variable, in order to eliminate the ones with significant difference from further analysis. In order to test hypothesis 6, we are only looking for variables, which don't differ significantly from one particular "Real" variable. The analysis will be extensively discussed further, while describing testing process of each hypothesis.
- Proximity matrix test, calculating the Euclidean distance between the variables and helping to identify the extent of difference between variables. Euclidean distance a common measure, based on the geometric distance in the multidimensional space. (Hill, Lewicki, 2005, p.118). This test will be applied for testing the hypotheses 2,3,4,5, in order to find out, which variable is the closest to the "Best case" variable.

Moroever, we have grouped the various survey questions into groups, in order to facilitate the statistical analysis. The grouping of questions was based on the hypotheses and one set of questions was dedicated for one hypothesis. There were 4 groups of questions created:

[8] For example, the survey question was "please indicate if you agree or disagree with a following statement: My company is highly committed to CSR issues". The respondent had to choose between answers in a Likert scale, ranging from 1 to 5 (5 meaning "strongly agree"). We fabricate a variable which assumes that all the respondents marked 5 as their answer.

- Supplier performance objectives, consisting of different theoretical success factors and their ratings by the respondents. This data set was used to test if quality is the most important success factor when evaluating the supplier's performance in pharmaceutical industry and consequently to test if quality is the most important success factor for supplier's performance.
- Indicators of material quality, consisting of various theoretical quality measurement techniques and their evaluation by the respondents. The answers were used to test if zero-defects objective should be achieved in product sample testing in pharmaceutical industry.
- Tools for optimized procurement performance, including theoretical procurement optimisation tools and the assessment by the respondents. The answers were used to find out which is the most commonly and extensively used procurement performance optimisation tool in pharmaceutical industry.
- Supplier relationship nature, comprising of two parts – question if the long term relationship is an objective for companies in pharmaceutical industry and question if various theoretical aspects of relationship with a supplier are perceived in pharmaceutical companies. The theoretical aspects of relationship, although it was not mentioned in the questionnaire, were related to theoretical benefits that can be gain through long-term relationship with suppliers. For the statistical analysis, responses for these two parts were consolidated into one data set.

6.2. Data Reliability

Reliability can be defined as extent to which measurements are repeatable (Nunally, 1967, mentioned in Cortina, 1993). Although there is a wide variety of ways to measure the reliability of the data, we chose Cronbach's alpha in order to test the reliability for the majority of our data. Known for its stability and flexibitliy, Cronbach's alpha is a function of internal consistency or interrelatedness of items. (Cortina, 1993). As noted before, we have grouped various questions in the survey, in order to create structure and facilitate application of the responses for statistical analysis.

However, many of the reliability tests, including Cronbach's alpha, are based on the assumption that the correlation between variables should be as high as possible. However,

based on our type of data and hypotheses, relatively low correlation between the variables is expected. For example we are analyzing how important are particular SRM tools in the respondent's company. Thus, we cannot expect high correlation, as it would highly irrelevant to expect that one respondent would be marking all the listed SRM tools as "core tools". Generally accepted understanding is that Cronbach's alpha is preferred to have scales with reliability greater than 0,7 – 0,8. However, due to the fact that we expect only moderate correlation between the variables in our data, we assume the threshold for Cronbach's alpha, indicating reliable data, to be lower. Moreover, as indicated by Duhachek et al. (2005), the sample size has significant impact on measuring Cronbach's alpha. Due to the relatively small sample size of our analysis, we predict that the size factor can have an effect on the final alpha measure.

The results for Cronbach's alpha for different data sets are presented in the table below. It is important to notice that we are testing the interrelatedness of the items in each set of questions, dedicated for different hypotheses. The data sets were extensively described before.

Factor	Related hypothesis	Reliability measure-Cronbach's Alpha
Supplier performance objectives	H1 – Material quality is the most important syccess factor	,638
Tools for optimized procurement performance	H3 – supplier relationship management is the most important tool	0,642
Indicators of material quality	H2 – product sampling is the most important indicator	**-,556**[9]
Supplier relationship nature	H4 – long term relationship model is the most important obejctive	,731

Figure 29. Reliability of data sets. Source: own creation

[9] The negative Cronbach's alpha for variable "determinants of material quality" indicates negative correlation between sets of variables. Generally, this case violates the assumption of internal consistency of the data set, due to negative correlation perceived. Thus, this data set will be used only for basic descriptive analysis.

Based on the numbers provided in the Figure 29 we conclude that the chosen data sets are reliable and we can continue with the statistical analysis of the data.

6.3. Testing the Hypotheses

6.4.1. Testing Hypothesis 1

H1 – *The material quality is the most important success factor in order to achieve high supplier performance.*.

Testing hypothesis 1 is based on the differences between the answers, identifying to which extent 5 factors are applied while evaluating supplier's performance in European pharmaceutical companies. In order to accept hypothesis 1 as true, it should be proven that the quality measure for supplier's performance evaluation will have the closest scores to the "best case" variable (indicating only scores for highest importance, based on answers from all the respondents).

		Delivery	Prices	Quality	Research contribution	Service	Best_case
N	Valid	18	18	18	18	18	18
	Missing	0	0	0	0	0	0
Mean		4,5556	4,1111	4,8889	3,5000	4,0000	5,0000
Std. Deviation		,61570	,75840	,32338	,92355	,90749	,00000
Minimum		3,00	2,00	4,00	2,00	2,00	5,00
Maximum		5,00	5,00	5,00	5,00	5,00	5,00

Figure 30. Descriptive statistics for data set of variables for testing hypothesis 1

From the descriptive statistics table above, it can be clearly seen that the closest measure to the "best case" is the quality measure, having the highest (4,89) mean. However, in order to ascertain that the hypothesis can be accepted to be true, we are going to test the data based on 2 other tests.

Firstly we apply Scheffe test in order to find out, if significant differences exist among the 5 “real” measures and the “best case” measure; as well we will find out where the actual differences exist in the data. (Acton 2009, p. 187)

Scheffe test - Multiple Comparisons for supplier performance evaluation

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Best case	Delivery	,44444	,22506	,566	-,3194	1,2083
	Quality	,11111	,22506	,999	-,6527	,8749
	Service	1,00000*	,22506	,003	,2362	1,7638
	Prices	,88889*	,22506	,012	,1251	1,6527
	Research contribution	1,50000*	,22506	,000	,7362	2,2638

*. The mean difference is significant at the 0.05 level.

Figure 31. Scheffe test for data set of supplier performance objectives

The Scheffe test indicates that there are no significant differences between groups “best case” and “delivery” and “best case” and “quality”. Thus, we conclude that the factors, marked to be the most important as supplier performance objectives (i.e. the closest to the “Best case” variable) are “delivery” and “quality”. However, as the hypothesis states that we are searching for the most important supplier performance objective, thus we must identify, whether “delivery” or “quality” is more important.

Thus, we calculate Euclidean distance between each of the groups and provide a proximity matrix as a result. Although the test generates a proximity matrix for means between each measure, we only use the data provided in the table below, as we are interested in the difference between the “Best case” group and other groups.

	Euclidean Distance					
	Delivery	Prices	Quality	Research contribution	Service	Best_case
Best_case	3,162	4,899	1,414	7,416	5,657	,000

Figure 32. Proximity matrix for data set of supplier performance objectives

The results of the proximity matrix are the same Scheffe test's - as the Euclidean distance (in comparison to Best case group) is lowest between "Best case" and "quality", followed by the second-lowest Euclidean distance between "Best case" and "Delivery".

Thus, based on empirical analysis, we conclude that quality is the most important factor for supplier performance evaluation and consequently the most important supplier performance objective. Hypothesis 1 is concluded to be true. However, it must be noticed that we do not claim that other factors are not important at all – based on the data we can conclude that delivery reliability is almost as important as quality. Further discussion about the findings will be provided in the following chapter "Findings".

6.4.2. Testing Hypothesis 2

H2 – Product testing results are the most important indicator of material quality within the pharmaceutical industry.

Testing hypothesis 2 is based on the assumption that majority of the respondents indicated that they are most usually using product sample testing as an indicator of product quality while choosing a new supplier. As indicated before, the reliability of the data couldn't be confirmed by using the Cronbach's alpha, thus we are not applying Scheffe test or proximity matrix test in this case. We are limiting the data analysis to descriptive statistics and simple conclusions that can be drawn.

	N	Minimum	Maximum	Mean	Std. Deviation
quality_MS	18	3,00	5,00	4,6667	,59409
product_samples	18	2,00	5,00	4,1111	,83235
certifications	18	2,00	5,00	4,2222	,94281
Valid N (listwise)	18				

Figure 33. Descriptive statistics for data set of indicators of material quality

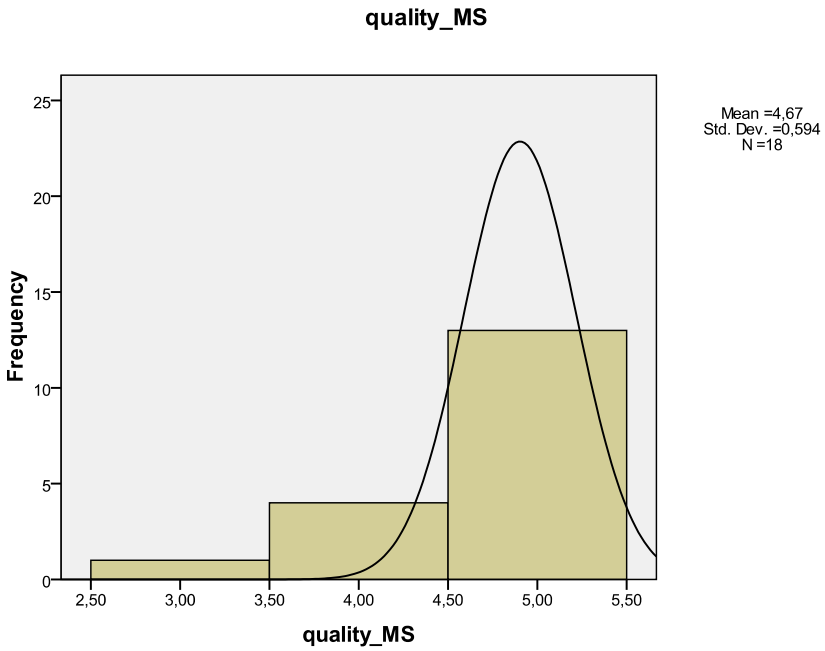

Figure 34. Histrogram for data set of responses regarding quality management system

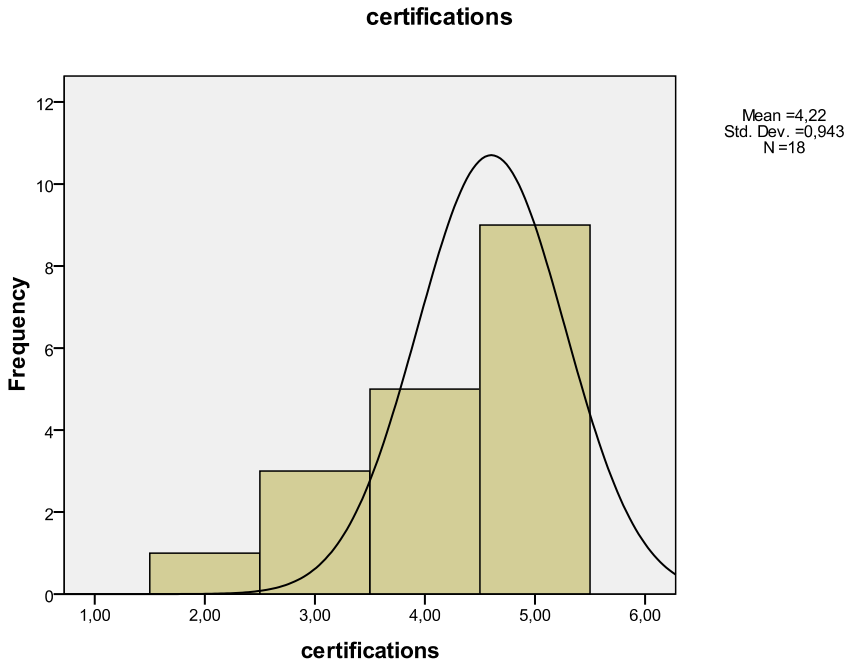

Figure 35. Histrogram for data set of responses regarding certifications, acquired by the supplier

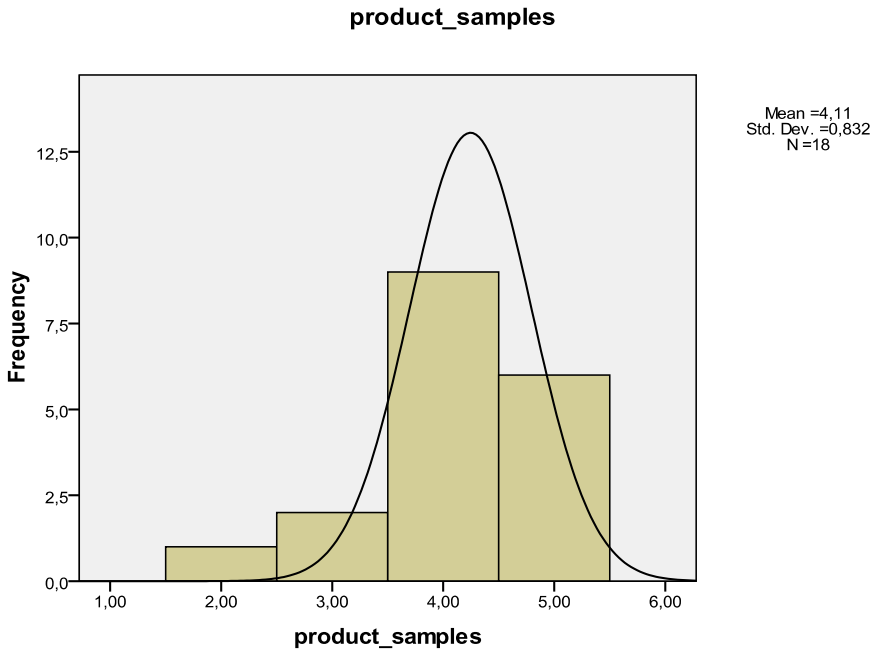

Figure 36. Histrogram for data set of responses regarding product sample testing

As it can be seen in the descriptive statistics table above, the measure with the highest mean is the “quality MS”, which is indicating supplier’s quality management system. Moreover, as indicated in the histograms above, only 11% of the respondents (1 out of 18) indicated quality management system as moderately important, in comparison to 22% (4 out of 18) respondents evaluating certificates, acquired by the supplier to be of moderate or lower importance; and 17 (3 out of 18) respondents indicating that product testing is of moderate or lower importance in their companies. Although the reliability of the data is questioned, we can conclude that based on basic statistics, the supplier’s quality management system is the most important indicator of product quality while choosing a new supplier.

Thus, based on empirical analysis, we conclude that supplier’s quality management system is the most important indicator of product quality while choosing a new supplier. Consequently, we conclude that the most important material quality indicator is supplier’s quality management system. The hypothesis 2 is considered to be false. However, it is important to notice that relevance of both certificates, acquired by the supplier as well as results of product sample testing are relevant for pharmaceutical industry, although they are identified to be not as important as supplier’s quality management system. Further discussion about rejection of hypothesis 2 and findings about the most important indicator of product quality will be provided in the upcoming chapter “findings”.

6.4.3. Testing Hypothesis 3

H3 – Supplier relationship management practices are the most effective tools for achieving high procurement performance within the pharmaceutical industry.

The test of hypothesis 3 is based on the differences between the answers, identifying to which extent 8 factors are applied while optimizing procurement performance in European pharmaceutical companies. In order to accept hypothesis 3 as true, it should be proven that "relationship management" tools will have the closest scores to the "best case" variable (indicating only scores for highest importance, based on answers from all the respondents).

	N	Minimum	Maximum	Mean	Std. Deviation
administrative_lead_time	18	1,00	5,00	3,3333	1,02899
amount_contracts	18	2,00	5,00	3,8333	,78591
amount_suppliers	18	2,00	5,00	3,9444	,93760
best_case	18	5,00	5,00	5,0000	,00000
e_procurement	18	1,00	5,00	2,2222	1,26284
employee_productivity	18	2,00	5,00	3,1667	1,15045
maverick_spend	18	1,00	5,00	3,9444	1,05564
relationship	18	3,00	5,00	4,5556	,61570
research_contr	18	,00	5,00	3,0556	1,16175
Valid N (listwise)	18				

Figure 37. Descriptive statistics for data set of tools for optimized procurement performance

From the descriptive statistics table above, it can be clearly seen that the closest measure to the "best case" is the "relationship" measure, having the highest (4,56) mean. However, in order to ascertain that the hypothesis can be accepted to be true, we are going to test the data based on 2 other tests.

Firstly we apply Scheffe test in order to find out, if significant differences exist among the 8 "real" measures and the "best case" measure; as well we will find out where the actual differences exist in the data. (Acton 2009, p. 187) Although the test generates a comparison matrix for means between each measure, we only use the data provided in the

table below, as we are interested in the difference between the “Best case” group and other groups.

(I) VAR00016	(J) VAR00016	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Best case	research_contr	1,94444*	,32044	,000	,6629	3,2260
	employee_productivity	1,83333*	,32044	,000	,5518	3,1149
	e_procurement	2,77778*	,32044	,000	1,4962	4,0593
	administrative_lead_time	1,66667*	,32044	,001	,3851	2,9482
	amount_contracts	1,16667	,32044	,113	-,1149	2,4482
	amount_suppliers	1,05556	,32044	,220	-,2260	2,3371
	relationship	,44444	,32044	,983	-,8371	1,7260
	maverick_spend	1,05556	,32044	,220	-,2260	2,3371

*. The mean difference is significant at the 0.05 level.

Figure 38. Scheffe test for data set of tools for optimized procurement performance

The Scheffe test indicates that there are no significant differences between groups “best case” and “amount contracts”, “best case” and “amount suppliers”, “best case” and “relationship”, “best case” and “maverick spend”. Thus, we conclude that the factors, marked to be the most important as procurement optimisation tools (i.e. the closest to the “Best case” variable) are “amount of contracts” and “amount of suppliers”, “relationship” and “maverick spend”. However, as the hypothesis states that we are searching for the most important procurement optimisation tool, thus we must identify, which of the previously mentioned factors is more important.

Thus, we calculate Euclidean distance between each of the groups and provide a proximity matrix as a result. Although the test generates a proximity matrix for means between each measure, we only use the data provided in the table below, as we are interested in the difference between the “Best case” group and other groups.

	Euclidean Distance								
	Best_case	Administrative_leadtime	Optimized amount of contracts	Optimized amount of suppliers	Employee productivity	E - procurement	Maverick_spend reduction	Relationship_management	Contribution to R&D
Best_case	,000	8,246	5,916	5,916	9,110	12,884	6,245	3,162	9,539

Figure 39. Proximity matrix for data set of tools for optimized procurement performance

The results of the proximity matrix are the same Scheffe test's - as the Euclidean distance (in comparison to Best case group) is lowest between "Best case" and "relationship management", followed by the other measures, generating relatively low Euclidean distance between "Best case" and "optimized amount of contracts", "best case" and "optimized amount of supplies", "best case" and maverick spend reduction".

Thus, based on empirical analysis, we conclude that relationship management is the most important/effective tool for procurement performance optimisation. Hypothesis 3 is concluded to be true. However, other procurement optimisation tools, such as optimized amount of contracts, optimized amount of suppliers and maverick spend reduction are almost as important as supplier relationship management tools in pharmaceutical industry. Further discussion about the findings will be provided in the following chapter "Findings".

6.4.4. Testing Hypothesis 4

H4 -Long term relationship is the most important contributor of optimized supplier relationship management

The test of hypothesis 4 is based on the differences between the answers, identifying to which extent 5 beneficial factors are a result of long term supplier relationships in European pharmaceutical companies. In order to accept hypothesis 4 as true, it should be proven that "long term relationship" is a factor related to 5 beneficial factors in the relationships with suppliers – supplier's contribution to R&D, knowledge sharing, possibility to contribute to supplier's strategic planning, relationship nature being based on mutual understanding and goals as well as mutual contributions to success.

	N	Minimum	Maximum	Mean	Std. Deviation
research_contr	18	2,00	5,00	3,3889	,84984
knowledge_sharing	18	3,00	5,00	3,7778	,64676
strategic_planning	18	2,00	5,00	3,7222	,75190
mutual_understanding_goals	18	3,00	5,00	4,0556	,53930
long_term_relationship	18	4,00	5,00	4,7222	,46089
success_contr	18	4,00	5,00	4,3889	,50163
Valid N (listwise)	18				

Figure 40. Descriptive statistics for data set of supplier relationship nature

In order to test, whether there is a significant relationship between the 5 beneficial relationship aspects and long term relationships applied, we apply Anova test. Firstly, we are testing whether there exists the homogeneity of variances by calculating Levene statistics. The results are presented in the table below. If the sig. value is higher than 0,05, it is considered that the homogeneity of variance exists.

	Levene Statistic	df1	df2	Sig.
contr_success	,250	1	16	,624
knolwedge	,064	1	16	,803
planning	2,134	1	16	,163
research	,018	1	16	,894
understanding	,074	1	16	,789

Figure 41. Test of homogeneity of variances for data set of supplier relationship nature

Furthermore, we are testing whether a significant difference exists between the beneficial relationship aspects and long term relationships.

		Sum of Squares	df	Mean Square	F	Sig.
contr_success	Between Groups	,014	1	,014	,049	,827
	Within Groups	4,431	16	,277		
	Total	4,444	17			
knolwedge	Between Groups	,377	1	,377	,985	,336
	Within Groups	6,123	16	,383		
	Total	6,500	17			
planning	Between Groups	,219	1	,219	,321	,579
	Within Groups	10,892	16	,681		
	Total	11,111	17			
research	Between Groups	,168	1	,168	,218	,647
	Within Groups	12,277	16	,767		
	Total	12,444	17			
understanding	Between Groups	,003	1	,003	,018	,896
	Within Groups	3,108	16	,194		
	Total	3,111	17			

Figure 42. ANOVA test for data set of supplier relationship nature

Generally, it is considered that if Sig. value is less than or equal to 0,05, then there is a significant difference. As all Sig. value are above 0.05, we can conclude that there is a positive relationship between long term supplier relationship and other variables.

Based on the statistical analysis, we can conclude that the hypothesis 4 is true and there is a positive relationship between long term supplier relationships and all listed beneficial aspects of relationship: "contribution to each other's success", "knowledge sharing", possibility to contribute to strategic planning of the supplier, supplier's contribution to R&D as well as mutual understanding as goals. The conclusions that we can make based on the proof of this statistical relationship will be discussed later in the following chapter "Findings".

7. Findings

In this chapter we are going to analyze more extensively the findings that we acquired from the survey, distributed to European pharmaceutical companies. The chapter is structured according to the hypotheses and provides detailed discussion of the findings, their implications for pharmaceutical procurement optimisation. Moreover the additional data and observations, gained from the survey will be as well incorporated into the discussion.

7.1. What Should be Optimised?

Hypothesis 1, proposing that ***quality*** in the most important factor when choosing a ***supplier*** in pharmaceutical industry, was *accepted*. Other factors, such as delivery reliability or prices were regarded by the respondents as less important for the evaluation of the supplier performance. Thus, we can assume that pharmaceutical industry, as expected, is extremely cautious about the quality of the raw materials that suppliers are providing. Although there were two respondents, considering delivery conditions to be slightly more important than the quality of the products, there were no respondents, doubting about that the fact that quality is important or extremely important. Surely, the most important supplier performance factor represents the crucial target for procurement performance, as it can be assumed that the highest quality of provided raw materials should be the primary objective of a procurement department in pharmaceutical industry.

Regarding the issue of finding price and quality balance, which is probably one of the main problems, encountered in the purchasing field, we consider that particularly in pharmaceutical industry, the quality factor is of higher value than the low price factor. This assumption is supported by the empirical findings too. Thus, price and many other advantages that a supplier can propose for the buyer should be considered only as secondary benefits, which should be evaluated only if the quality factor is satisfactory. Moreover, it could be quite reasonable to predict that delivery would be a significant success factor for a procurement department in any industry, as the basic understanding of purchasing is based on assumption that the most added-value of procurement department is

created by assuring the delivery reliability. However, we consider this assumption to be based on the approach towards purchasing as an operational function. As we have previously discussed, the approach towards purchasing should be changed from purchasing as only operational function to purchasing as strategic function of a company. If a strategic approach is applied, then it can be assumed that not only delivery reliability or price is taken into consideration while purchasing, but as well other strategically important factors such as quality. The finding that quality is considered to be slightly more important than delivery reliability or price shows that the approach towards purchasing has evolved from the basic approach towards understanding of purchasing as a strategic function. We consider this finding to be highly relevant for all the manufacturing companies in pharmaceutical industry, as we believe this approach should be applied by all companies willing to achieve optimised procurement performance in pharmaceutical industry.

As we consider that quality is the most important in supplier's performance for pharmaceutical industry, we believe that further analysis should as well be directed towards understanding, how the quality of the procured materials can be indicated and ensured, what tools and methods should be used in order to optimise this factor.

7.2. What Indicates Optimisation in Supplier's Performance?

After identifying the main success factor for procurement optimisation, we as well found out which is the most important indicator for material quality.

As the choice of the supplier was proven to be not of crucial importance for supplier relationship management, we interpret the results gained from the survey in the context of relationship management with the existing suppliers. Although sample testing is still proven to be relevant when choosing a new supplier in pharmaceutical industry, auditing the quality management system of the supplier is considered to be more important. Rejection of the hypothesis of the product sample testing can be justified by the nature of the pharmaceutical industry, when due to strict regulations for production of supplied materials, it is assumed that the production process will be corresponding to the quality management system without any variations. Moreover, it could be quite challenging and expensive to make sample tests for each product supplied, thus generally it can be considered that quality management system audit can be sufficient tools for ensuring the

quality of the product, proposed by a new supplier. Thus the most important supplier performance objective (for a new supplier) is proven to be high results in the quality management system audit.

As the evaluation of the supplier's quality management system is considered to be the most important factor when evaluating if a supplier would provide high quality products, we can assume that the quality management system would be as well tracked for the existing suppliers. Moreover, it can be assumed that after a contract is signed with a supplier, the product quality verification tools can be implemented when receiving the batches of the products. However, this responsibility might be transferred to the quality control department of the company or the manufacturing department. In this case, feedback about the quality verification results should be provided for the purchasing department and if necessary, the purchasing department might apply certain tools which would improve the supplier's performance regarding quality or other supply opportunities might be searched by the procurement department, in case it appears to be impossible to achieve required quality with the existing supplier. Further we will discuss what tools procurement department can apply in order to influence the supplier performance in quality.

7.3. How Should Supplier's Performance be Optimised?

The answers of the survey respondents supported our hypothesis, claiming that relationship management is the best way to influence the supplier's performance. Thus we can assume that in comparison to other procurement performance improvement tools such as maverick spend reduction or employee productivity, tools for building and sustaining beneficial relationship with the supplier is the most effective. Thus it is clear that supplier relationship management tools should gain the most attention in the strategic procurement management context as well as should be emphasized in work of each raw material buyer in pharmaceutical industry. Moreover, we noticed that optimisation of the amount of suppliers for a material group and optimisation of amount of contracts for a material group are considered almost as effective as the supplier relationship management. We consider that the supplier relationship management is slightly more important than other procurement optimisation tools, as it directly targets the supplier's performance, in comparison to other tools, which are more related to internal functioning of procurement

department. This assumption is based on the fact that even when the internal functions of the procurement department are perfectly organized, e.g. the employee productivity is very high, it doesn't have a very high impact of the supplier performance. For example, it is much more crucial to apply a suitable relationship model for a supplier, than to ensure the employee productivity, as the relationship nature with the supplier directly affects the behavior of the supplier. Moreover, optimisation of the amount of contracts and amount of suppliers per material group as well as maverick spend reduction were proven to be almost as important tools as supplier relationship management. These three tools as well directly aim at modifying the relationships with the suppliers, thus directly influencing the final supplier performance measures.

Based on the empirical analysis and discussion about the procurement optimisation tools, we can conclude that the more impact a tool has on the actual supplier's performance, the more crucial it is. Thus the procurement department should primarily focus on the optimisation tools which have the closest connection with the supplier. The internal purchasing organization tools, such as employee productivity or purchasing department's contribution to R&D were proven to be only secondary tools, which should be employed after optimal performance has been achieved in supplier relationship management and other supplier-related tools.

7.4. Recommendations for Supplier Relationship Management

After claiming that supplier relationship management is the most important tool for influencing the supplier's performance, we are going to further investigate what model the supplier relationship management should applied in pharmaceutical industry and what benefits can be gained.

While investigating the nature of the relationship with the suppliers in pharmaceutical industry, we noticed that all the procurement professionals are claiming that they are focusing on building long term relationships with their core suppliers. As discussed before, the focus of the relationship management depends on the nature of the products supplied. Some of pharmaceutical raw materials for production can be considered to be standardized, such as natural products (e.g. sugar), however even the standardized products can be considered as close architecture products, when deviation from the specifications is not

tolerated as well as the specifications are kept confidential form the third parties. Moreover, the manufacturers can be considered to be highly dependent on the suppliers and their performance due to very complex and slow manufacturing process, which restrain possibility for application of the substitutes as well as lack of access to potential direct substitutes.

Moreover, our assumption that the general understanding of the benefits gained from long term relationships with the supplier was as well supported by the attitude of the procurement professionals. As the respondents claimed that long-term relationship with the core suppliers is the main focus for their procurement departments, they as well confirmed that the nature of the relationship is includes such benefits as mutual understanding, supplier's contribution to R&D of the company, knowledge sharing, and possibility to influence the strategic planning of the core suppliers. Moreover, we can conclude that generally long term relationships with suppliers are based contributions to achieve mutual success.

However, although the survey generally supported our attitude towards long term relationships as positive and beneficial factor for procurement optimisation, additional data disclosed that opportunistic behavior is still frequent in the relationship between the purchasers and suppliers. Thus, we believe that it is even more important to emphasize that supplier relationships should be established and maintained with great prudence and cautiousness. Moreover, emphasis must be laid on successful relationship management techniques, which prevent opportunistic behavior in both parties of the relationship – supplier and buyer, in order to ensure that the nature of the relationship is not competitive, but collaborative.

Also, when analysing the most important success factors in supplier's performance (for testing hypothesis 1) we found out that supplier's contribution to R&D was rated not that important as other success factors. The lower rating of supplier's contribution to R&D can be justified by assumption that the nature of R&D in pharmaceutical industry, which is normally kept strictly confidential from any business partners due to the risk that the information about R&D could leak to the competitors. However, it can be considered as a further development of the relationship with the supplier stage, when trust would be built in the relationship with the supplier and supplier could provide additional benefits to the buyer, such as collaboration between the R&D departments and significant contributions.

As the most important success factor of supplier's performance is quality, surely supplier relationship management is a suitable tool for influencing this success factor. As discussed before, if the some negative results of the quality verification is received by the procurement department, the procurement department should react to that by applying supplier relationship management tools. In this case, it is necessary to choose the relevant supplier relationship management model and collaborative approach might be the best option is many cases. The collaborative purchasing approach could be applied by open discussion about the disadvantages in quality, cross-functional meetings between the supplier's and buyer's representatives and other tools which would target at finding mutually beneficial solutions. Surely, in most cases (when hostile behavior is not perceived in the supplier's side) it is crucially important not to break the trust in the relationship with the supplier. As discussed in the theoretical part of the master thesis, supplier performance can be optimized only through collaboration, which is achieved through long-term supplier relationship model. Thus long-term relationship should be the target for relationship with all suppliers, which are considered to be important by the procurement department. Moreover, the collaborative approach should be applied from the first contact with the supplier, and even when choosing the supplier as it builds a significant foundation for potential new relationship with the supplier.

8. Conclusions and Recommendations

Procurement in both pharmaceutical industry as well as in other fields can be an extremely beneficial strategic function. However, if managed not successfully, procurement department might be just an operational activity, creating no added value and accounting for many lost opportunities. As the importance of strategic procurement has been emphasized widely, the benefits of successful strategic procurement have been discussed as well. However, significant lack of definition and understanding of procurement as a system can be noticed in the academic world, which is a well preventing one of the most important aspects of procurement – successful performance measurement. We used application of balanced scorecard as a framework for our Master thesis. Particularly, evidence show that serious issues exist when applying balanced scorecard for performance measurement of procurement department.

However, we believe it is reasonable to expect that definition and broad understanding of a procurement system can be highly beneficial not only for performance measurement of procurement department, but it should be also valuable as guidance for strategic procurement development. Moreover, it is crucial to ensure that every employee of procurement department has the extended understanding of how procurement department works as a system as well as how the performance of it can be optimized. Thus it is clear that one of the main goals of our Master thesis – extending the understanding of procurement system – is highly valuable and beneficial for many academics and practitioners, who are interested in procurement.

Throughout the Master thesis, we have investigated the application of balanced scorecard for procurement department in a detailed way. Although this performance measurement framework is claimed to be vastly flexible and suitable for a broad range of various organizations and departments, we found out that significant adjustments should be made before applying the balanced scorecard for procurement department. After investigation of various procurement optimisation perspectives and performance measurement theory, we concluded that the fifth perspective should be added to the primary structure of balanced scorecard – the supplier perspective. Thus, we claim that initial balanced scorecard framework is not sufficient for procurement performance measurement purposes and

balanced scorecard should be supplemented with the fifth supplier perspective. After enhancing the framework with the necessary adjustments, the further, more detailed analysis of different perspectives of the balanced scorecard was performed and the summarizing model was created. Procurement measurement model presents all the perspectives of the balanced scorecard as the success factors of procurement, as well as the relations between the success factors, procurement objectives and key performance indicators, which are suggested to be used for measurement of performance in the procurement department. Based on the structure of the balanced scorecard, we identified five procurement performance perspectives: financial, customer, internal business process, learning and growth and supplier perspectives, which are extensively analyzed in regard to success factors as antecedents of high procurement performance, objectives as consequences of high procurement performance and as well indicators for the objectives.

Although based mostly on theoretical knowledge and managerial literature as well as some reflections of procurement employees in professional websites, the model can be highly valuable for different reasons. Firstly, it can be useful as a general overview of procurement system, when only basic understanding is necessary to achieve. Also, it can be used for creating a performance measurement system for procurement department, as it clearly shows both the options for various strategic procurement objectives as well as presents suggestions of how progress on achieving chosen objectives can be measured. Finally, if supplemented by the discussions about procurement optimisation throughout all master thesis, the model can be used as a guiding tool for strategic decisions of procurement optimisation.

Moreover, the initial target of our Master thesis is not just to present the above described system, but also to gain additional knowledge about the system, such as to determine the most important success factors for procurement optimisation. Evaluation and weighting of different factors in procurement measurement model is considered to be extremely important for guidance of strategic procurement optimisation decisions. As we defined based on our theoretical knowledge as well as personal considerations and assumptions, we defined the most important procurement performance driver to be supplier performance. Moreover, due to crucial important of supplier performance, we comprehensively investigated the nature of the supplier performance by using empirical analysis.

Before analyzing the results of the empirical analysis we tested the reliability of the statistical analysis in order to ensure that the conclusions based on empirical analysis can be used by other academics researching procurement optimisation and practitioners applying the knowledge presented in the master thesis.

After performing several statistical analysis projects for each data set chosen for empirical analysis, we discussed the findings that have impact both for procurement optimisation. Moreover, we aimed at creating a pilot study that would be as well beneficial for academics, further researching the subject of purchasing optimisation, thus our findings will be as well presented as recommendations for further research in the following chapter. Our empirical analysis was limited to researching purchasing of materials for production in pharmaceutical industry as well as we were investigating only supplier performance perspective in comparison to five procurement performance perspectives presented in the theoretical chapter. We were targeting to clarify what should primarily be optimised in supplier's performance, what indicates supplier's performance optimisation and how supplier's performance should be optimised through internal procurement tools.

Firstly, we claimed that theoretically the most important success factor in supplier's perspective is material quality. After testing this hypothesis empirically, we accepted the hypothesis and concluded that quality is in fact the most important success factor, however importance of delivery reliability and prices were perceived to be almost as important as quality. Moreover, we were targeting at not only defining the success factors but as well showing which area should be the primary focus of procurement optimisation. Because of the findings achieved in the empirical part we can conclude that the primary optimisation focus in pharmaceutical industry should achieving quality of the materials and only in case of confirmed quality other areas should be evaluated in supplier's performance, such as assuring delivery reliability and reducing prices. Moreover, these findings provide a guideline for balancing price and quality in pharmaceutical purchasing as we claim when choosing between price and quality, higher weight should be appointed for quality factors. This guideline is as well supported by the theoretically recommended strategic approach towards purchasing where assurance of delivery reliability and reduction of prices is considered to be the primary target of operational purchasing in contrary to quality as a main goal of strategic purchasing.

Secondly, we have discovered that perceiving zero defects in product sample testing is of secondary importance when choosing a new supplier for pharmaceutical industry and the most important objective for supplier is to implement efficient and effective quality management system. Quality objectives for supplier's performance in pharmaceutical industry are highly influenced by extremely strict manufacturing regulations and control for products that are used for pharmaceutical manufacturing as well as product sample testing is a complex and expensive process. We assume that this finding is highly dependent on the context of industry and different findings might be achieved when testing supplier's quality performance indicators in other industries. Moreover, although choice and implementation of quality management system is primarily the supplier's responsibility, the supplier's quality performance can be improved by efforts of the buyer's purchasing department. Depending on the quality verification results, provided by quality control or manufacturing department, procurement department can apply supplier relationship management tools in order to assure that not only optimisation of the supplier's quality management system, but as well affecting the actual quality of the supplied products. These benefits can be achieved by collaborative approach to relationship with the supplier when collaborative discussion and intercompany team work is emphasized in contrary to engaging in adversarial relationship, preventing collaborative synergies. Moreover, after optimising the supplier relationship management, other procurement optimisation tools, directly related to supply base development should be applied. As the empirical analysis showed, such supply base development tools as optimisation of amount of contracts/suppliers per material group are emphasized in pharmaceutical procurement almost as much as supplier relationship management.

Finally, we found out that long term relationship is in fact a very beneficial tool in pharmaceutical industry, which is currently already being applied in the companies, presented by the respondents. This finding is supported by the academic recommendations that long term relationship should be targeted when purchasing conditions are as identified in pharmaceutical industry – closed architecture products, high dependency on the supplier, aggravated substituting process and other factors, motivating pharmaceutical material buyers to collaborate with the suppliers. It was as well proven that such benefits as supplier's contribution to buyer's R&D, possibility to influence supplier's strategic planning, facilitate mutual knowledge sharing, mutual understanding and goals and overall

contribution to each other's success are main beneficial characteristics of long term relationship with the supplier in pharmaceutical industry.

It is very important to notice that the aimed at creating a pilot study which would provide guidance for further academic research. Thus we are presenting our recommendations for further research in the following chapter. However, we believe that practical implications of our conclusions are as well valid as guidance for strategic procurement management and performance measurement.

9. Reflections and Further Research

Before starting to write this Master thesis, we have carefully investigated the topic of firms' procurement, which is of our interest, in order to find critical problem in this field. We have noticed the lack of adequate procurement measurement framework, as well as analysed literature has helped us to identify the lack of understanding about procurement as a system, which leads to a failure of sufficient procurement evaluation. We have developed the solution for the named issues in our thesis and thus, we filled in the gap in academic literature on procurement and suggested the framework and new knowledge which can be directly applied in companies for procurement performance optimisation. This can be named as a significant advantage of our Master thesis.

We have built the framework for procurement measurement and optimisation basing it on different perspectives, which have importance in creating or improving strategic procurement, and on factors affecting the procurement. The framework was based on BSC, which was chosen after reviewing other models for organisation performance measurement We have approached the creation of this model and its empirical testing from objective point of view, thus, making it applicable not only to certain individual cases, but broadly and universally available and valid. Whereas we have adapted the framework for pharmaceutical industry in empirical part, it can be applied across various industries, differently sized companies, manufacturing and service-based companies, and finally for purchasing of all groups of materials. While employing our procurement optimisation framework in companies, it should be adjusted according to the strategy and vision of a company.

Additionally, due to the systems approach we were able to construct the optimized framework by taking into consideration overall company's and procurement strategies, different perspectives and the factors with positive effect on the procurement and the positive relations between all these aspects, which hereby enables synergetic effect in the framework.

After developing the model, we have chosen pharmaceutical industry, more exactly, manufacturing companies, for empirical testing of our model. The target of the empirical research was to make a pilot survey which would test if research instrument as a whole

functions well. Also, our research had limited time resources as well as we found a lack of academic knowledge currently available. Thus due to knowledge and time limitations we were aiming to make a pilot survey in the empirical analysis, in order to create guidelines for further research and practical procurement optimisation. The data reliability is lower in comparison to comprehensive studies, however it is sufficient for considering that our empirical findings can be applied for further research as well as could guide procurement manager's practical activities.

Moreover, we have based our research on systems theory, and we have chosen an objective view towards the existing knowledge and towards the empirical research. While choosing a questionnaire as a mean of empirical investigation, we believed that the knowledge of respondents and thus their answers would reflect the situation in their companies objectively due to the fact that they are a part of procurement system and thus their knowledge is influenced by this system. Nonetheless, we should accept the possibility, that the pilot survey may be scant of objectivity if the respondents have subjectively answered the questions.

Furthermore, in the process of building procurement performance measurement framework we have searched for and a named a number of key performance indexes and chose the most important ones according to this list. Even though we have analysed plenty of literature on procurement topic, even more written sources exist. Therefore, it is possible that we have considered not all existing key performance indexes of procurement and probably we can state that it is even impossible to mention totally all of the existing ones.

Also, it is cannot be expected that all the existing success factors of procurement performance were taken into consideration as well as not all possible procurement optimisation tools or other aspects were reviewed. However, it is important to note that our approach for choosing which factors to include in the master thesis was based on the evaluation of importance and impact of these factors. Thus, while further applying our theoretical model, empirical guidelines or optimisation recommendations, it is very important to notice our goal to analyze factors based on their importance; however in many cases a possibility for introduction of factors, other than mentioned in our master thesis, should not be rejected.

We have used pilot survey as a main method for empirical investigation of our research. It is necessary to make a further investigation in this topic. Further scientific research could be made in order to contribute to and develop the framework and its appliance:

- More extensive survey should be made in order to confirm the results of our pilot survey.
- Our procurement optimisation framework could be tested for procurement of maintenance, repair, and operating supplies, capital goods and maverick procurement, and services in pharmaceutical industry.
- The framework could be empirically tested in different than pharmaceutical manufacturing companies, i.e. different industries or service-based companies as well as public organisations.
- To analyze and empirically test other procurement performance perspectives, their impact on performance measurement and procurement optimisation.

References

Ammer, D. (1989) Top Management's View of the Purchasing Function. *Journal of Purchasing and Materials Management*, vol. 25, iss. 3, pp. 16-21.

Anderson, M.G. and Katz, P.B. (1998) Strategic Sourcing. *International Journal of Logistics Management*, vol. 9, no. 1, pp. 1–13.

Arbnor, I. and Bjerke, B. (1997) *Methodology for Creating Business Knowledge*, 2nd Edition. SAGE Publications, London.

Axelsson, B., Laage-Hellman, J. and Nilsson, U. (2002) Modern management accounting for modern purchasing. *European Journal of Purchasing & Supply Management*, vol. 8, iss. 1, pp. 53-62.

Bacidore, J.M., Boquist, J.A., Milbourn, T.T. and Thakor, A.V. (1997) The Search for the Best Financial Performance Measure. *Financial Analysts Journal*, vol. 53, no. 3, pp. 11-20.

Baily, P., Farmer, D., Crocker, B., Jessop, D. and Jones, D. (2008) Procurement Principles and Management, 10th edition. Pearson education Ltd, Harlow.

Beatham, S. and Anumba Ch. and Thorpe, T. (2004) KPIs: a critical appraisal of their use in construction. Benchmarking: An International Journal Vol. 11 No. 1, 2004 pp. 93-117

Berger P.D, and Zeng A.Z (2006) Single Versus Multiple Sourcing in the Presence of Risks. Journal of Operational Research Society, vol. 57, no. 3, pp. 250-261

Boer L., Labro E., Morlacchi P. (2001) A Review of Methods Supporting Supplier Selection. *European Journal of Purchasing & Supply Management*, vol. 7, no. 2, pp. 75-89.

Bozarth, C., Handfield, R. and Das, A. (1998) Stages of global sourcing strategy evolution: an exploratory study. *Journal of Operations Management*, vol. 16, iss. 2-3, pp. 241–255

Brymann, A. and Bell, E. (2003) *Business research methods*. Oxford University Press, New York.

Buchanan, M. (2008) *Profitable buying strategies: How to cut procurement costs and buy your way to higher profits.* Kogan Page Ltd., London.

Bull, R. (2007) Performance Measurement. *Financial management, London*, Iss.: Nov., pp. 33-34.

Burrell, G. and Morgan, G. (1979) *Sociological Paradigms and Organisational Analysis*. Gower, Aldershot.

Carr, A.S. and Smeltzer, L.R. (1997) An empirically based operational definition of strategic purchasing. *European Journal of Purchasing and Supply Management*, vol. 3, no. 4, pp. 199–207.

Carr, A.S. and Smeltzer, L.R. (1999) The relationship of strategic purchasing to supply chain management. *European Journal of Purchasing and Supply Management*, Vol. 5, pp. 43-51.

Carter, J.R, and Ram, N. (1996) Is purchasing really strategic? *International Journal of Purchasing and Materials Management*, vol. 32, iss. 1, pp. 20-28.

Cavinato, J.L., Flynn, A.E. and Kauffman, R.G. (2006) *Supply management handbook*, 7th edition. The McGraw-Hill Companies, New York.

Cho, D.S., Chu, W. and Dyer, J. (1996), Strategic Supplier Segmentation: A Model for Managing Suppliers in the 21st Century", *16th Strategic Management Society Conference*, Phoenix.

Cortina, J.M. (1993) What Is Coefficient Alpha? An Examination of Theory and Applications. *Journal of Applied Psychology*, vol.78, no.1, pp. 98-104.

Cousins, P.D., Lawson, B. and Squire, B. (2006) An Empirical Taxonomy of Purchasing Functions. *International Journal of Operations & Production Management*, vol. 26, no. 7, pp. 775-794.

Cox, A. (1996) Relational competence and strategic procurement management. *European Journal of Purchasing and Supply Management*, vol 2, no. 1, pp. 57-70.

Dimitri, N., Piga, G. and Spagnolo, G. (2006) *Handbook of procurement*. Cambridge University Press, Cambridge.

Dixon, J., Nanni, A. and Vollmann, T. (1990) *The New Performance Measurement Challenge: Measuring Operations for World- Class Competition*. Dow Jones-Irwin/APICS, Homewood, IL.

Duhachek, A., Coughlan, A.T. and Iacobucci, D. (2005) Results on the Standard Error of the Coefficient Alpha Index of Reliability. *Marketing Science*, vol. 24, no. 2, pp. 294–301.

Dyer, J.H., Cho, D.S. and Chu, W. (1998) Strategic Supplier Segmentation: the Next "Best Practice" in Supply Chain Management. *California Management Review*, vol. 40, no. 2, pp. 57-77.

Easton, L., Murphy, D.J. and Pearson, J.N. (2002) Purchasing Performance Evaluation: with Data Envelopment Analysis. *European Journal of Purchasing & Supply Management*, vol. 8, iss.3, pp.123–134.

EFPIA (2009) *The Pharmaceutical Industry in Figures*. Key data, 2009 Update. Belgium.

Ellram, L.M., Zsidisin, G.A. and Siferd, S.P. (2002) The Impact of Purchasing and Supply Management Activities on Corporate Success. *Journal of Supply Chain Management*, vol. 38, no. 1, pp. 4-17.

Farmer, D. and van Weele, A. (1995) *Gower Handbook of Purchasing Management*, 2nd edition. Gower publishing Ltd., Aldershot.

Folan, P. and Browne, J. (2005) A Review of Performance Measurement: Towards Performance Management. *Computers in Industry*, vol. 56, iss. 7, pp. 663–680

Freeman, V.T. and Cavinato, J.L. (1990) Fitting Purchasing to the Strategic Firm: Frameworks, Processes and Values. *Journal of Purchasing and Materials Management*, vol. 26, iss. 1, pp. 1-12.

Gebauer, J., Beam, C. and Segev, A. (1998) Impact of the Internet on Procurement. *Acquisition Review Quarterly*, Spring-1998 , pp. 167-184.

Gelderman, C.J and van Weele, A.J. (2003) Handling Measurement Issues and Strategic Directions in Kraljic's Purchasing Portfolio Model. Journal of Purchasing and Supply Chain Management, vol. 9, iss. 5-6, pp. 207-216.

Gelderman C.J. and van Weele, A.J. (2005) Purchasing Portfolio Models: a Critique and Update. *The Journal of Supply Chain Management*: a Global Review of Purchasing and Supply, vol. 41, no. 3, pp. 19-28.

Goffin, K., Lemke, F. and Szwejczewski, M. (2006) An Exploratory Study of 'Close' Supplier–Manufacturer Relationships. *Journal of Operations Management*, vol. 24, iss. 2, pp. 189-209.

Hammesley, M. (1992) "By what criteria should ethnographic research be judged?", in Hammersley, M. (Ed.) *What's wrong with ethnography?: Methodological Explorations*. Routlege, London. pp. 57-84.

Hill, T. and Lewicki, P. (2005) *Statistics: Methods and applications*. StatSoft, Inc., Tulsa.

Hoyt, J. and Huq F. (2000) From Arms-length to Collaborative Relationships in the Supply Chain. An Evolutionary Process. *International Journal of Physical Distribution and Logistics Management*, vol. 30, no. 9, pp. 750-764.

Ijioui, R., Emmerich, H. and Cyep, M., (2007) *Strategies and Tactics in Supply Chain Event Management*. Springer, Aachen, Germany.

Investopedia dictionary. Retrieved from www.investopedia.com on 10-05-2009.

Jack, A. (2008) Balancing Big Pharma's Books. *BMJ,* Iss. 336 (23 February), pp. 418-419, doi:10.1136/bmj.39491.469005.94, Retrieved from http://www.bmj.com/cgi/content/full/336/7641/418?rss=1 on 01-05-2009.

Jones, B. and Oliver, J. (2006) *Measuring purchasing performance*. The Chartered Institute of Purchasing & Supply. CIPS Publications, UK.

Juran, J.M. and Godfrey, A.B. (1998) Quality in Supplier Relations. McGraw-Hill Professional.

Kaplan, R. and Norton, D. (1992) The Balanced Scorecard—Measures that Drive Performance. *Harvard Business Review*, vol. 70, no. 1, pp. 71–79.

Kaplan, R.S. and Norton, D.P. (1993) Putting the Balanced Scorecard to Work. *Harvard Business Review*, Sep – Oct, pp. 2-16.

Kaplan, R. and Norton, D. (1996) Using the Balanced Scorecard as a Strategic Management System, *Harvard Business Review*, vol. 74, iss. 1, pp. 75–85.

Kaplan, R.S. and Norton, D.P. (1996a) Linking the Balanced Scorecard to Strategy. California Management Review, vol. 39, no. 1, pp. 53-79.

Kaplan, R.S. and Norton, D.P. (1996b) *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business School Press, Boston.

Kaplan, R.S., Norton, D.P. (2000) *The Strategy Focused Organization— How Balanced Scorecard Companies Thrive in the New Business Environment*. Harvard Business School Press, Boston, MA.

Kaplan, R.S. and Norton, D.P., (2001). Transforming the Balanced Scorecard from Performance Measurement to Strategic Management: Part I. *Accounting Horizons*, vol. 15, no.1, pp. 87-104.

Kerkhoff, G. (2005) *The Bermuda Triangle of Business Procurement: How to Exploit Dormant Potential*. WILEY-VCH Verlag GmbH & Co.KGaA, Weinheim.

Kestenbaum, M.I. and Straight, R.L. (1995) Procurement Performance: Measuring Quality, Effectiveness, and Efficiency. *Public Productivity & Management Review*. vol.19, no.2, pp. 200-215.

KPI library: Supply Chain and Logistics KPIs. Retrieved from www.kpilibrary.com on 10-05-2009.

Krajic, P. (1983) Purchasing Must Become Supply Management. *Harvard Business Review*, September-October 1983, pp. 107-118.

Kuada, J. (2008) *Research Methods in Social Science – A Student Project Guide*. Centre for International Business, Aalborg University, Aalborg.

Lambert, D.M., Cooper, M.C. and Pagh, J.D. (1998) Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, vol. 9, no.2, pp. 1-20.

LeBlanc, D.C. (2003) *Statistics: Concepts and Applications for Science*. Jones & Bartlett Publishers, London.

Lee, M., Lee, Y. and Jeong, C. (2003) A High-Quality Supplier Selection Model for Supply Chain Management and ISO 9001 System. *Production Planning & Control*, vol. 14, no. 3, pp. 225-232.

Lian, P.C.S. and Laing, A.W. (2004) Public Sector Purchasing of Health Services: A Comparison with Private Sector Purchasing. *Journal of Purchasing & Supply Management*, vol.10, iss. 6, pp.247–256.

Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001) Defining Supply Chain Management. *Journal of Business Logistics*, vol. 22, no. 2, pp. 1-25.

Miller, R., Ciaran Acton, C. and Fullerton, D. (2009) *SPPS Statistics for Social Scientists*, 2nd edition. Palgrave Macmillan, Hampshire, UK.

Min, H. and Galle, W.P. (2006) Green Purchasing Strategies: Trends and Implications. *Journal of Supply Chain Management*, vol.33, iss. 3, pp. 10-17.

Mohr, J., Spekman R. (1994), Characteristics of Partnership Success: Partnership Attributes, Communication Behavior, and Conflict Resolution Techniques. *Strategic Management Journal*, vol. 15, no. 2, pp. 135-152.

Monczka, R.M., Trent, R.J., Callahan, T.J. (1993) Supply Base Strategies to Maximize Supplier Performance. *International Journal of Physical Distribution & Logistics Management*, vol. 23, no. 4, pp. 42-54.

Murray, J.G. (2001) Local Government and Private Sector Purchasing Strategy: a Comparative Study. *European Journal of Purchasing & Supply Management*, vol. 7, iss. 2, pp 91-100.

Otley, D. (1999) Performance Measurement: a Framework for Management Control Systems Research. *Management Accounting Research*, vol. 10, no. 4, pp. 363-382.

Pearson, J.N. and Gritzmacher, K.J. (1990) Integrating Purchasing into Strategic Management, *Long Range Planning*, vol. 23, no. 3, pp. 91-99.

Pearson, J.N. and Mendez, E.G. (1994) Purchasing's Role in Product Development: the Case for Time-Based Strategies. *International Journal of Purchasing and Materials Management*, vol. 30, no. 1, pp. 3-12.

Peroni, A. and Panciroli B. (2002) Innovation as a Determinant of Suppliers' Roles and Performances: an Empirical Study in the Food Machinery Industry. Journal of Operations Management, vol. 8, iss.3, pp.135-149

Peterson, J.J., Snee, R.D., McAllister, P.R., Schofield, T.L., Carella, A.J. (2009) Statistics in Pharmaceutical Development and Manufacturing. *Journal of Quality Technology*; vol.41, no.2, pp. 111-134.

Philippart, M. (2009) *The Evolution of Procurement in the Pharmaceutical Industry*. Website of The purchasing and logistics association of Belgium. Retrieved from http://www.abcal.org/fichiersimportes/database/what_next_for_procurement_version2_philippart.pdf, on 10-06-2009.

Pooler, V.H. and Pooler, D.J. (1997) *Purchasing and Supply Management: Creating the Vision*. Chapman & Hall, New York.

Pugh, D.S. (1983) "Studying Organisational Structure and Process" in Morgan, G. (ed.) *Beyond Method*, Newbury Park, Calif.: Sage.

Ring, P.S., van de Ven, A.H. (1994) Developmental Processes of Cooperative Interorganizational Relationships. *Academic Management Review*, vol. 19, no 1, pp. 90–118.

Saraph, J.V., Benson, P.G., Schroeder R.G. (1989) An Instrument for Measuring the Critical Factors of Quality Management. Decision sciences, vol.20, no. 4

Saunders, M. (1997) *Strategic Purchasing and Supply Chain Management*, 2nd edition. Pearson Education Limited, Harlow, England.

Shah, N. (2004) Pharmaceutical Supply Chains: Key Issues and Strategies for Optimisation. *Computers and Chemical Engineering*, vol. 28, no. 6-7, pp. 929-941.

Shaw, D.G. (1995) Performance Measurement, Management, and Appraisal Sourcebook. Human Resource Developement Press, Amherst.

Stewart, T.A. (1997) *Intellectual Capital: The New Wealth of Organizations*. Doubleday/Currency, New York.

Suarez Bello, M.J. (2003) *A Case Study Approach to the Supplier Selection Process*. Master thesis, University of Puerto Rico. Retrieved from http://grad.uprm.edu/tesis/suarezbello.pdf on 29-04-2009.

Temte, A. et. al (2004) Financial Statement Analysis. Dearborn Trade Publishing.

Trent, R.J. (2007) *Strategic Supply Management: Creating the Next Source of Competitive Advantage*. J. Ross Publishing, USA.

Van Weele, A.J. (2002) *Purchasing and Supply Chain Management. Analysis, Planning and Practice*, 3rd edition. Thomson Learning, London.

Verma R. and Pullman, M.E. (1998) An Analysis of Supplier Selection Process. *Omega*, vol. 26, no. 6, pp. 739-750.

Vonderembse, M.A. and Tracey, M. (1999) The Impact of Supplier Selection Criteria and Supplier Involvement on Manufacturing Performance. *The Journal of Supply Chain Management*, vol. 35, no. 3, pp. 33-39.

Wagner, S.M. and Kaufmann, L. (2004) Overcoming the main barriers in initiating and using purchasing-BSCs. Journal of purchasing and supply management, Vol. 10, No. 6, pp. 269-281.

Weber, C.A., Current, J.R. and Benton, W.C. (1991) Vendor Selection Criteria and Methods. *European Journal of Operational Research*, vol. 50, no. 1, pp. 2-18.

Wisner, J. and Fawcett, S. (1991) Linking Firm Strategy to Operating Decisions through Performance Measurement. *Production and Inventory Management Journal*, vol. 32, no. 3, pp. 5–11.

Appendix 1 - The Overview of KPIs

Financial perspective

Success factor	Key performance indicators
Operating expenses management	• Procurement volume/total sales (Kerkhoff, 2005) • **Procurement ROI = procurement operating expenses/total sales** (www.kpilibrary.com, 2009) • Order costs / core suppliers (Kerkhoff, 2005) • Order costs / non-core suppliers (Kerkhoff, 2005) • Order costs /material groups (ABC) (Kerkhoff, 2005) • Order costs /number of purchase orders (Pooler & Pooler, 1997)
Cash flow management	• Evaluation of payment conditions with suppliers– average period for payment (Kerkhoff, 2005) • **Cash flow improvements = average number of payment days/number of suppliers** (www.kpilibrary.com, 2009)
Cost management	• **Procurement total savings - total annual savings/annual purchases** (Pooler & Pooler, 1997) • % of actual vs. estimated savings (www.kpilibrary.com, 2009) • Percentage of spend handled by purchasing (www.kpilibrary.com, 2009)

Customer perspective

Success factor	Key performance indicators
Strategic management of procurement internal business process in regard to balance between price and quality	• % of suppliers, running minority-owned or women-owned or small businesses (Kestenbaum & Straight, 1995) • % of procurement spend on recycled materials (www.kpilibrary.com, 2009) • **Number of complaints regarding product quality from the final customer** (www.kpilibrary.com, 2009)
Relationship management with internal customers	• OTIF (On Time In Full) measures (www.kpilibrary.com, 2009) • **Satisfaction survey feedback = % of stakeholders satisfied with their supplier (measured by survey responses)** (www.kpilibrary.com, 2009) • Number of OTIF complaints (Kerkhoff, 2005)

Internal business process perspective

Success factor	Key performance indicators
Increased collaboration with R&D department	• Work initiated by procurement/work received by procurement (Farmer & Van Weele, 1995) • **FTE for R&D related projects** (Farmer & van Weele, 1995) • Number of changes in products/services, initiated by procurement (Farmer & Van Weele, 1995) • Savings from innovative solutions (Farmer & Van Weele, 1995)
Human resource management	• Change in number of employees in operational/strategic purchasing (per supplier) – (Kerkhoff, 2005) • **Productivity = Procurement spend per employee** (Kerkhoff, 2005)
E-procurement management	• % of spend, on e-procurement (www.kpilibrary.com, 2009) • % of suppliers, on e-procurement (www.kpilibrary.com, 2009) • **Extent of e-procurement application = % of spend on e-procurement auctions in comparison to considered optimal %** (www.kpilibrary.com, 2009) • % of spend on electronic order processing systems (Kerkhoff, 2005)
Order management	• **Improvement in order management process = Change in administrative leadtime in comparison to base period (processing time – from Purchase order to actual purchase)** (Farmer & Van Weele, 1995) • Order backlog per buyer (i.e. number of orders which are not yet delivered) (Farmer & Van Weele, 1995) • % of invoices disputed (www.kpilibrary.com, 2009) • % of emergency orders (www.kpilibrary.com, 2009) • MRP exemptions cycle time (response time to change in demand) (www.kpilibrary.com, 2009) • % of payable invoices, not matched to Purchasing order(www.kpilibrary.com, 2009)
Supplier relationship management	• Number and Change of % of Suppliers, CS, NCS – base period/report period (Kerkhoff, 2005) • Number of suppliers above some industry

	benchmark index ((Kerkhoff, 2005) • Number of suppliers per MG (Kerkhoff, 2005) Relationship building efforts for CS and NCS suppliers, to be written) – maybe communication frequency (Farmer & Van Weele, 1995) • **Supplier relationship management improvements = savings achieved in regard to supplier relationship management optimisation** (www.kpilibrary.com, 2009) • Average biddings/bidding procedure (www.kpilibrary.com, 2009) • % of suppliers, responsible for 80% of spend (www.kpilibrary.com, 2009) • % of preferred but not used suppliers (www.kpilibrary.com, 2009) • % of RFP that needed improvements, based on suppliers responses (www.kpilibrary.com, 2009)
Contract management and compliance	• Contract quota (no. of contracts/no. of suppliers) (Kerkhoff, 2005) • Contractual structure – general agreements, volume contracts, agreements on terms & conditions (Kerkhoff, 2005) • Change in number of new contracts (Kerkhoff, 2005) • **Maverick spend = % of maverick spend/purchasing spend** (Kerkhoff, 2005)
Outsourcing	• % of spend offshore (www.kpilibrary.com, 2009) • **% of managed procurement spend outsourced** (www.kpilibrary.com, 2009) • Travel and entertainment costs as % of gross margin (www.kpilibrary.com, 2009)

Learning & growth perspective

Success factor	**Key performance indicators**
Investment in development of skills of employees	• **Employee training (hours/employee)** (Kerkhoff, 2005)

Supplier performance perspective

Success factor	**Key performance indicators**
Supplier relationship management	• **Delay quota - % of delayed deliveries** (Kerkhoff, 2005)

Quality managemnet	• **Number of defects = Number of quality/specifications complaints from internal customers** (Kerkhoff, 2005) • Number of defected parts/million received (Farmer & Van Weele, 1995) • % of initial sampling rejects (Farmer & Van Weele, 1995) • Number of non-conformities during vendor inspection (www.kpilibrary.com, 2009)
Analysis of supplier's pricing strategy	• **Price development = benchmarking on price or % of savings in terms or price** (www.kpilibrary.com, 2009)
Supplier relationship management	• General customer satisfaction (purchasing as customer and other stakeholders) in terms of accessibility (Farmer & Van Weele, 1995) • % of supplier that applied business code of conduct (www.kpilibrary.com, 2009) • **Satisfaction survey feedback = % of stakeholders, satisfied with the supplier** (www.kpilibrary.com, 2009)
Supplier relationship management	• Number of innovative suggestions (Farmer & Van Weele, 1995) • **Suppliers' R&D contribution = Number of R&D projects, where suppliers are involved** (Kerkhoff, 2005)

Appendix 2 - The Questionnaire

1. How many employees work in your company?

(1) ❑ ≤49

(2) ❑ 50-249

(3) ❑ ≥250

(4) ❑ I don't know

2. What is your company's turnover?

(1) ❑ ≤ €10 million

(2) ❑ €10 million - €50 million

(3) ❑ > €50 million

(4) ❑ I don't know

3. Please indicate which country your company's procurement head office is located in:

_____

4. What is your job title?

(1) ❑ Procurement general director

(2) ❑ Procurement vice-president/director

(3) ❑ Senior procurement manager

(4) ❑ Procurement manager

(5) ❑ Assistant procurement manager

(6) ❑ Other _____

5. Please indicate to which extent you agree or disagree with the following statement:

Our company is very much concerned about our suppliers' ability to fulfill their contractual obligations.

(1) ❑ Strongly agree

(2) ❑ Agree

(3) ❑ Neutral

(5) ❑ Strongly disagree

(4) ❑ Disagree

6. Please indicate which is the most important factor while evaluating the supplier's performance in your company (on the scale 1-not important; 5-extremely important)

	1	2	3	4	5
Reliability of delivery by our suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Quality of items supplied by our suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Suppliers' service quality (measured in terms of flexibility, responsiveness, and availability)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Prices that our suppliers charge	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Suppliers' ability to contribute to our R&D efforts	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

Please indicate and briefly explain other important factors that you use for evaluation of present suppliers, which are not mentioned above:

_____

7. Please indicate, how important are the following factors for evaluating the quality of material that potential new supplier suggests (1–not important; 5–extremely important):

	1	2	3	4	5
Supplier's quality management system	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Acquired certifications and qualifications (e.g. ISO certification)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Quality of the product samples, provided for testing before signing the purchase contract	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

Please indicate and briefly explain other important factors that you use for evaluating material quality, however they are not mentioned above:

_____

8. Please indicate, to which extent are the following internal tools used in your company in order to increase the procurement performance:

	Not used	Rarely used	Often used	Usually used	Core tools
We are attempting to contribute to R&D (e.g. by suggesting better materials available in the market)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to achieve high employee productivity	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to buy as much as possible through e-procurement auctions	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to minimise the time period from receiving the purchase order to submitting the purchase order to the supplier	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to optimise the amount of contracts (e.g. per material group)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to minimise the amount of suppliers (e.g. per material group)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to emphasize the importance of the relationship with the suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We are attempting to minimise maverick spend (i.e. purchasing	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

	Not used	Rarely used	Often used	Usually used	Core tools

outside the preferred contracts)

Please indicate and briefly explain other internal tools which you are using and which are important, however they are not mentioned above:

_____

9. Please indicate to what extent different aspects of Supplier Relationship Management (SRM) are emphasized in your company:

	Not emphasized	Rarely emphasized	Often emphasized	Usually emphasized	Core aspect of SRM
Tools and methodologies for choice of the right supplier	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Supplier base development tools and methodologies (e.g. control of quantity of suppliers/material group, control the balance in quantity of core/non-core suppliers)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Spend analysis (e.g. analysis & control of how much money is spent for one supplier in a material group)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Supplier market analysis & internal supplier rating (e.g. determination of preferred/not-preferred suppliers)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Supplier relationship building & sustaining tools & methodologies (e.g. communication quality, trust building)	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

Please indicate and briefly explain if there are other important SRM aspects, applied in your company, however they are not mentioned above:

_____

10. Please indicate to what extent you agree or disagree with the following statement:

We are putting efforts to maintain long-term relationships with raw material suppliers

(1) ❑ Strongly agree

(2) ❑ Agree

(3) ❑ Neutral

(4) ❑ Disagree

(5) ❑ Strongly disagree

11. Please indicate to what extent you agree with the following statements regarding commitment in the relationship between you and your suppliers:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Our suppliers often contribute to the R&D function of our company	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
In the case of the core suppliers, we contribute to the strategic planning of the supplier	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Mutual knowledge and know-how sharing is commonly practiced between us and our suppliers.	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
The relationship with our suppliers is based on mutual understanding and mutual goals.	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We and our suppliers are both contributing to each other's success.	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

12. Please indicate to what extent you agree with the following statements regarding trust in the relationship between you and your suppliers:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
We trust our suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Opportunistic behavior has never happened among our suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
We have never behaved opportunistically with our suppliers	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Our relationship with our suppliers is based on mutual honesty and transparency	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

If you want to receive finalised Master thesis with the results of the survey and recommendations, please enter your email in the field below.

_____

_____