LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT
School of Business and Management
Master's Programme in Supply Management

Olli Salonen

PROCUREMENT IN INDUSTRIAL AFTER-SALES SERVICES – CHARACTERISTICS AND PERFORMANCE MEASUREMENT

Examiners: Professor Katrina Lintukangas
Associate Professor Mika Immonen

ABSTRACT

Author:	Olli Salonen
Title:	Procurement in industrial after-sales services – Characteristics and performance measurement
Faculty:	LUT School of Business and Management
Master's Programme:	Supply Management
Year:	2021
Master's Thesis:	Lappeenranta-Lahti University of Technology LUT 84 pages, 9 figures, 7 tables, 2 appendices
Examiners:	Professor Katrina Lintukangas Associate Professor Mika Immonen
Keywords:	Industrial after-sales services, Procurement, Performance measurement, Procurement performance measurement

This thesis examines the characteristics and performance measurement of the procurement function in the context of industrial after-sales services. As the rapidly changing market environment and ever-increasing competition has challenged manufacturing firms during the last decades, the interest in industrial after-sales services has increased. This study has two targets. First, research aims to identify the characteristics of the procurement function in industrial after-sales service business. The aim is to understand the key success factors and the environment of the industrial after-sales services from the perspective of the procurement function. Second, the identified characteristics are aligned to the procurement performance measurement and the key factors of the procurement performance measurement are examined.

To achieve the objectives of the thesis, a single-case study was conducted. Total of four semi-structured interviews were held with the employees of the case company. According to the findings, the large range of diverse items and the urgency of the customer deliveries defines the environment of the procurement function in a context of industrial after-sales services. As a consequence of this, time and reliability of supplier deliveries are seen as the most critical dimensions of procurement performance measurement. The results of the study are difficult to generalize but they can function as a step towards generalization.

Tiivistelmä

Tekijä:	Olli Salonen
Tutkielman nimi:	Hankinnat teollisissa myynnin jälkeisissä palveluissa – Ominaispiirteet ja suorituskyvyn mittaaminen
Tiedekunta:	Kauppatieteellinen tiedekunta
Pääaine:	Hankintojen johtaminen
Vuosi:	2021
Pro Gradu -tutkielma:	Lappeenrannan-Lahden teknillinen yliopisto LUT 84 sivua, 9 kuvaajaa, 7 taulukkoa, 2 liitettä
Tarkastajat:	Professori Katrina Lintukangas Tutkijaopettaja Mika Immonen
Avainsanat:	Teolliset myynnin jälkeiset palvelut, Hankintatoimi, Suorituskyvyn mittaaminen, Hankinnan suorituskyvyn mittaaminen

Tutkielman tarkoituksena on tutkia yrityksen hankintaa teollisten myynnin jälkeisten palvelujen kontekstissa. Kun nopeasti muuttuva toimintaympäristö sekä jatkuvasti kasvava kilpailu on haastanut valmistavan teollisuuden yrityksiä viimeisten vuosikymmenien aikana, on yritysten kiinnostus teollisia myynnin jälkeisiä palveluja kohtaan kasvanut. Tällä tutkielmalla on kaksi tavoitetta. Ensinnäkin tutkielma pyrkii tunnistamaan hankinnan ominaispiirteet yrityksen teollisten myynnin jälkeisten palvelujen kontekstissa. Tavoitteena on ymmärtää tärkeimmät menestystekijät ja toimintaympäristö teollisten myynnin jälkeisten palvelujen kontekstissa hankinnan toimintojen näkökulmasta. Toiseksi tunnistetut ominaispiirteet yhdistetään sopivaksi hankinnan suorituskyvyn mittaamiselle ja tutkielmassa tutkitaan hankinnan suorituskyvyn mittaamiseen liittyviä tärkeimpiä tekijöitä.

Näiden tavoitteiden saavuttamiseksi suoritettiin tapaustutkimus. Tutkimusta varten järjestettiin yhteensä neljä haastattelua, joissa yhden yrityksen työntekijöitä haastateltiin puolistrukturoidun kysymyslistan avulla. Tutkimuksen löydösten mukaan tutkielman kontekstissa merkittävimpiä tekijöitä hankinnan näkökulmasta ovat laaja valikoima hyvin erilaisia tuotteita sekä asiakastoimitusten kiireellisyys. Näiden seurauksena suorituskyvyn mittaamisessa korostuvat toimittajien lähetysten nopeus sekä luotettavuus. Tutkimuksen tulokset eivät ole yleistettävissä, mutta ne voivat toimia askeleena kohti yleistettävyyttä.

Table of contents

Appendices

List of figures

List of tables

1. Introduction

1.1 Background

In manufacturing industries, the main focus has traditionally been on product-related strategies which, depending on their market positions, seek to gain competitive advantage through technology innovations, quality developments, and/or cost reductions. However, global trends such as developed competitiveness of emerging countries, globalization, increased customer awareness, and volatility of customer demands have changed the business environment of the manufacturing industry. (Lay, Copani, Jäger & Biege 2010, 715-716) As a response to these changes and to differentiate their offerings, manufacturing firms have since the beginning of the 21st century increasingly transformed their business model first from offering products to offering services/products and finally offering solutions (Cova & Salle 2008, 270; Gebauer, Gustafsson & Witell 2011).

The lucrative environment of industrial services has also increasingly impacted the attention of managers and researchers. Studies have found that the after-sales market in the industrial field can be four or five times larger related to the market of new products (Bundschuh & Dezvane 2003). It is also estimated that after-sales services and spare parts may generate over three times the turnover of the original purchase during the lifecycle of the product (Wise & Baumgartner 1999). Especially in industries such as aerospace, automotive, and high-tech technology after-sales services like inception, maintenance, and spare part delivery may generate a large part of total revenues (Gzara, Nematollahi & Dasci 2014). Firms have also recognized after-sales services' close connection with customer satisfaction and retention and consider services as an important source of competitive advantage (Alexander, Dayal, Dempsey & Vander Ark 2002; Armistead & Clark 1992). These consequences have enhanced the view that the strategic management of after-sales operations should have an important role in manufacturing firms (Saccani, Johansson & Perona 2007, 53).

In strategic management, performance measurement is fundamentally recognized as a critical process for the success of organizations because it can help to understand the effectiveness of actions, shape behavior, and lead to competitive outcomes. Performance

measurement is also seen as a requirement for world-class performance and achieving organizational goals, which has encouraged firms in all industries to invest time in building and managing measurement processes (Fawcett & Cooper 1998). In the field of supply chain management, the importance of performance measurement has become more significant. The main reason for this is that firms have started to pay more attention to performance improvement through the integration of separate functions in the value chain. (Lohman, Fortuin & Wouters 2004, 267)

Procurement operations can have a significant impact on a firm's cost containment, quality, logistics, flexibility, and innovation (Nair, Jayaram & Das 2015). Studies have estimated that the allocated costs of purchasing and supply management functions range from 30% of the cost of products sold up to 70% of the cost of products depending on the industries (Quinn 2005). Hence, it can be argued that procurement performance does not have only an impact on the supply management performance of the firm but also on the competitiveness of the firm. This also pinpoints the importance of procurement performance measurement.

Even though several guiding frameworks for performance measurement are created in managerial and academic fields, appropriate actions for performance measurement are strongly dependent on the context. Suitable metrics may vary widely, depending on the industry, organizational culture, size, market environment, and other elements. (Evans 2004) Hence, understanding the context is highly important for appropriate performance measurement. The key in this thesis is to understand the context of industrial after-sales services so that the procurement measurement could be performed successfully.

1.2 Preliminary literature review

Performance measurement has been widely recognized as a significant process in organization management (Fawcett & Cooper 1998; Neely 1999). It is considered as a prerequisite for assessing strategy and decisions (Chan & Qi 2002; Lohman et al. 2004, 267). The essence of the performance measurement, for most organizations, is that it indicates whether the path they are currently going is following the strategy or not (Ishaq Bhatti, Awan & Razaq 2014, 3217). Earlier studies have found that properly performed performance measurement can help organizations to understand their position (Fawcett & Cooper 1998),

improve their resource allocation and communication (Chan & Qi 2002), support strategy, and mold behavior for desired direction (Neely, Gregory & Platts 1995). It is also found that mature performance measurement systems may eventually lead to positive results in terms of customer, financial, and market performance (Evans 2004, 230).

In the field of supply chain management, the strategic nature of the procurement function has been a controversial topic (Goebel, Marshall & Locander 2003, 4; Chen, Paulraj & Lado 2004; Das, Narasimhan & Talluri 2006; Lawson, Cousins, Handfield & Petersen 2009). The question has been whether procurement function really has a strategic role in a business (Carter & Narasimhan 1996; Goebel et al. 2003, 4). From a managerial perspective, the strategic role of procurement is considered obvious due to the direct impact on quality, deliveries, flexibility, innovation, and total spend of goods (Nair et al. 2015, 6263). Also, supply risks faced by firms are often managed through procurement operations (Zsidisin, Melnyk & Ragatz 2005). Therefore, procurement function is increasingly recognized as a vital strategic function of the firm and a source to gain competitive advantage (Lawson et al. 2009; Monczka, Handfield, Giunipero & Patterson 2009).

Earlier studies underline the prominent influence of purchasing performance on firms' competitiveness. (Schoenherr, Modi, Benton, Carter, Choi, Larson, Leenders, Mabert, Narasimhan & Wagner 2014, 2; Nair et al. 2015, 6263). Partly due to this, several studies have emphasized the need for purchasing function to align with the business strategy of the firm (Carter & Narasimhan 1996; Cox 1996; Schoenherr et al. 2014, 30; Lindgreen, Vanhamme, van Raaij & Johnston 2013). Since purchasing has indeed a major impact on the overall performance of the firm (Carter & Narasimhan 1996), it cannot be viewed as a separate function but rather understand that purchasing decisions have effects on competitiveness. Thus, the importance of measuring procurement performance as part of the performance management process can be considered rather high.

Measurement of purchasing performance has long been a popular research topic. The roots can be found from 1931 when the National Association of Purchasing Agents (NAPA) organized the best paper contest regarding the topic. Later, in their landmark study, Hayes and Renard (1962) contributed to the development of the field by constructing a survey where 201 companies assessed their performance measurement practices in terms of

purchasing (Lardenoije, van Raaij & van Weele 2005). Fresh attention towards the topic was gained through the studies of Monczka, Carter and Hoagland (1979) and van Weele (1984) who both examined practices of purchasing performance measurement in American and Dutch business.

At the end of the millennium, the study of Neely (1999) gained interest in performance measurement in the field of general management literature, when he referred to several studies on the subject and discussed the performance measurement revolution. However, even though purchasing performance had already received attention, it would have been too far-fetched to discuss revolution in the field of purchasing and supply management at the time (Lardenoije et al. 2005). In general management literature, perhaps the best-known framework for performance measurement is the balanced scorecard by Kaplan and Norton (1992). The balanced scorecard provided decision-makers a fast but comprehensive overview of a firm's performance by measuring four perspectives of financial, customer, internal business, and innovation and learning (Kaplan & Norton 1992).

In the field of purchasing and supply management, performance measurement can mean several things, depending on the perspective (Lardenoije et al. 2005). In many cases, procurement performance is discussed in terms of supplier performance (e. g. Trent & Monczka 1998, 7; Goffin, Lemke & Szwejczewski 2006; Hsu, Kannan, Leong & Kan 2006). Some authors in turn have focused more on measuring buyer firms' performance (e. g. Hendrick & Ruch 1988). In this thesis, procurement performance is seen as a combination of suppliers' performance and buyer firm's internal performance.

Even though performance measurement has already gained a fair amount of attention as a research topic, the area is still fruitful for research, especially in the field of supply chain management (Akyuz & Erkan 2010). For instance, empirical studies about implementing performance measurement systems (Lohman et al. 2004), and studies about "fit" metrics between the environment and organization (Akyuz & Erkan 2010), are limited in the academic literature. Also, managerial tools for procurement measurement are needed (Lardenoije et al. 2005). In addition, the academic research of after-sales services is limited in an industrial context (Nordin 2005). Hence, this thesis aims to fill these research gaps by studying the consequences and meaning of context for the procurement performance

measurement activities. Due to the increasing interest in industrial services, this study may also provide valuable and fresh practical information through the analysis of procurement characteristics in this field.

1.3 Research questions and objectives

The objective of this thesis can be divided into two parts. First, the aim is to illustrate the role and key success factors of procurement operations in the industrial after-sales service business. Second, through these identified context-specific characteristics of the procurement function, this thesis aims to find out how these aspects should be taken into account in performance measurement. In a theoretical part of the study, procurement performance measurement is discussed broadly at a general level. Viewing the issue at first from a broad perspective can be valuable since the special attributes of performance measurement in the context of industrial after-sales services can then be compared to the general theory of procurement performance measurement. Thus, it may be easier to understand the critical factors of the measurement when operating in the field of industrial after-sales services.

The basis for the study is that the context and the environment should affect the performance measurement. The idea is not to give suggestions about the specific metrics but rather understand the dimensions of procurement performance measures that are in alignment with the context of industrial after-sales business. To reach this objective, it is important to understand the context thoroughly.

To clarify the purpose of the thesis, the research questions are set to support the goals of the thesis. The first research question is functioning as a backbone for the thesis, and it is broadly defined as follows:

Research question 1: *What are the special characteristics of the procurement function in the industrial after-sales service business?*

The purpose of the first research question is to illustrate the attributes of procurement in the context of the industrial after-sales service business. The role and importance of procurement

operations for a successful business will be emphasized and thoroughly reviewed. It is essential to understand thoroughly the context and the key success factors of the business model in order that the procurement function can be developed and modified to fit the overall strategy. Hence, the second research question is formulated as:

Research question 2: *What are the key success factors of procurement functions in the industrial after-sales service business?*

The second research question focuses on finding the most critical aspects of managing procurement operations in the industrial service business. Thus, the thesis aims to provide managerial implications also for strategic planning for how procurement functions should be organized in the industrial after-sales service business. To underline the special features of procurement, and to provide more managerial implications, the thesis also examines how characteristics should be involved in performance measurement. Hence, the third research question is:

Research question 3: *Which procurement performance dimensions are important to measure in the industrial after-sales service business?*

The third research question is including the most critical aspects of performance measurement of procurement functions. Like mentioned earlier, measuring performance is a vital process for successful organization management (Fawcett & Cooper 1998). The academic field of the topic is still developing and therefore, this research could provide useful information to increase the maturity in the field of procurement operations management. The first two research questions function as a backbone for the third research question by defining comprehensively the context for procurement measurement research. A theoretical framework is discussed more in the next chapter to illustrate more precisely the core of the thesis.

1.4 Conceptual framework

Key concepts of this thesis are industrial after-sales services, procurement operation management, and performance measurement. In this thesis, the interdependencies between these concepts are examined. In figure 1, the conceptual framework is presented.

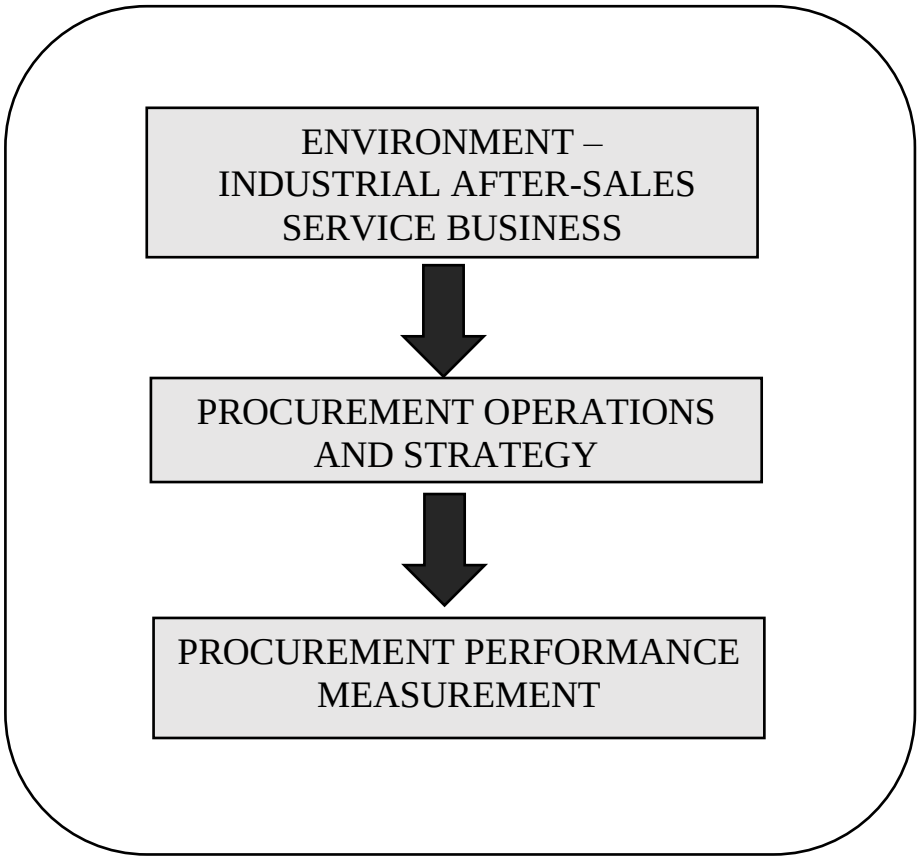

Figure 1. Conceptual framework

Figure 1 illustrates the relationship between the key concepts. The context of industrial after-sales services is functioning as a backbone for the study. It is seen as an environment that sets the framework for what is seen as suitable actions in managing procurement operations. Thus, it also affects the procurement strategy which in turn molds the procurement performance measurement activities to match with the environmental frameworks. Procurement performance measurement should therefore be in alignment with the overall business strategy and the environment.

1.5 Definitions of Key Concepts

1.5.1 Industrial after-sales service

Industrial after-sales services is considered in this thesis as a combination of goods and services provided in the business-to-business market after the purchase has done. An industrial after-sales service cannot be classified strictly as a service or good. Rather, it should be viewed as a product, assuming that the product can consist of characteristics of both goods and services simultaneously. This product can be a tangible good such as spare parts or consumables, or a service such as field engineering. (Johansson 2006) Tangible goods are mainly focused on this thesis due to the procurement perspective. In this context, the procurement function is often responsible for the upstream flow of spare parts, not the engineering services.

1.5.2 Performance measurement

Performance measurement is seen as a key part of the performance management process of an organization (Bourne, Neely, Mills & Platts 2003). Yet, there is no clear definition for performance measurement (Neely et al. 1995, 80). In this thesis, performance measurement is seen as an action which most essentially provides information to the managers about the state of the organization or function. Hence, performance measurement is defined here as "evaluating how well organizations are managed and the value they deliver for customers and other stakeholders" (Moullin 2002, 188).

1.5.3 Procurement

In literature, procurement is seen as a rather complex process to define. Depending on the circumstance, it can be defined in various ways, but typically it is seen as an act of buying or obtaining goods and services for the firm. (Novack & Simco 1991) Procurement is seen in this study as the management of the firm's external resources in order that the supply of all required resources for running, maintaining, and managing the firm's primary and support functions are ensured (van Weele 2010). Given the context, these resources are mainly

tangible products that are needed to support the strategy of the firm in industrial after-sales services.

1.5.4 Key performance indicator (KPI)

Key performance indicators are indicators that focus on the most crucial aspects of organizational performance and are viewed as the most critical for the success of the organization (Parmenter 2015). KPIs are considered to be the main instrument in the management of business performance. Typically, KPIs are calculated from the operational data, but they are often utilized also at the strategic and tactical levels in decision making. (Roubtsova & Michell 2013)

KPIs vary widely depending on the strategic objectives and the context. Procurement operations commonly use six categories to measure performance: cost, time, quality, flexibility, innovation, and sustainability (Caniato, Luzzini & Ronchi 2014, 14). These categories can be seen as the core for procurement performance measurement and thus affect a firm's procurement performance.

1.6 Structure of the thesis

The thesis will include seven chapters: introduction, three theoretical chapters, methodology, findings and analysis, and discussion and conclusions. After the introduction, the theoretical part of the thesis begins. First, in chapter 2, the environment of industrial after-sales services is introduced. In chapter 3, procurement as a term is defined. Also, the role of the procurement function is discussed. The last chapter of the theoretical part is about performance measurement. Starting from chapter 5, the empirical part of the thesis begins. First, the research methodology is presented. In chapter 6, findings and analysis of the empirical research is introduced. Finally, in chapter 7, research questions are answered, concluding implications are presented, and limitations and future research are discussed. The structure of the thesis is illustrated in figure 2.

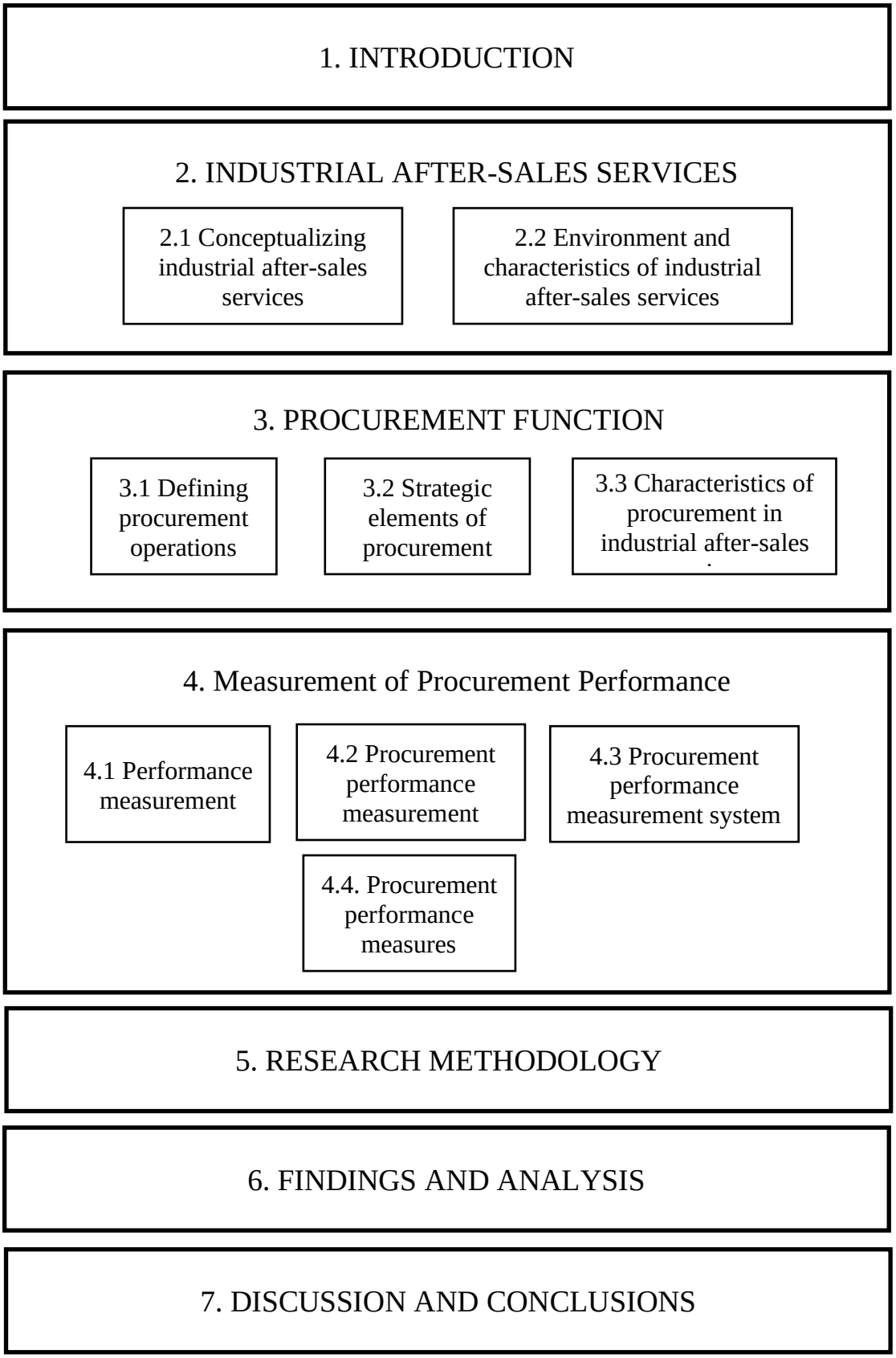

Figure 2. Structure of thesis

2. Industrial After-Sales Services

In order that the characteristics, key success factors, and performance measurement of procurement operations could be analyzed, it is necessary to understand the business environment. Thus, in this chapter, the environment of industrial after-sales services is discussed. Based on earlier literature, the term "industrial after-sales services" is conceptualized and differentiates between services in general and industrial services are defined. In addition, the background factors that have led to the growth of industrial services are discussed.

The approach towards industrial after-sales services in this thesis is holistic. Even though examples from some industries have been brought up, the focus is on examining the characteristics and key elements related to industrial after-sales services regardless of the industry. The scope of the thesis is in the manufacturing industry. Therefore, differentiates between fields such as automotive and aerospace industry in terms of after-sales services are not distinguished. Rather, this chapter seeks to provide common aspects and elements regardless of the manufacturing field.

2.1 Conceptualizing industrial after-sales services

Levitt (1983) points out that the relationship between buyer and seller is seldom over after the sale is made. Nowadays in the industrial field, various after-sales activities are included in the transaction between buyer and seller. This phenomenon is connected to the theory of core competence (Prahalad & Hamel 1990) which states that the intention of the customer is to purchase the function provided by the product, not the physical good itself (Johansson 2006, 19-20). The theory of core competencies is closely connected to outsourcing decisions. Quinn and Hilmer (1994) famously argued that firms should solely focus on their core competencies and strategically outsource most of the remaining activities in order to a gain competitive advantage. As a consequence, after-sales service activities are no longer made in-house but outsourced from after-sales service providers (Johansson 2006, 20).

Services are broadly considered as an activity or set of activities that provides value and fulfill needs (Grönroos 1990; Johne & Stoney 1998). Typically, services are defined through the attributes that differ between services and goods. These attributes are e.g. according to Zeithaml, Parasuraman and Berry (1985) intangibility, perishability, heterogeneity, and simultaneity. However, industrial services can be seen as an exception because these criteria are not met. Industrial services are often linked to a good or technology or it includes goods or technology. Hence, industrial service can be tangible. (Martinsuo, Nenonen & Vaittinen 2020) Further, industrial after-sales services should be viewed as a product which is neither solely a good nor solely a service but a product consisting of both service and good characteristics (Johansson 2006, 20).

In literature, industrial services are sometimes aggregated with services at a general level, which has been seen as a conceptual problem. Industrial services have several distinctive characteristics that differentiate them from services in general. (Morris & Fuller 1989)

Services can be categorized depending on their characteristics and position in the firm's portfolio. In figure 3, the classification of services is presented.

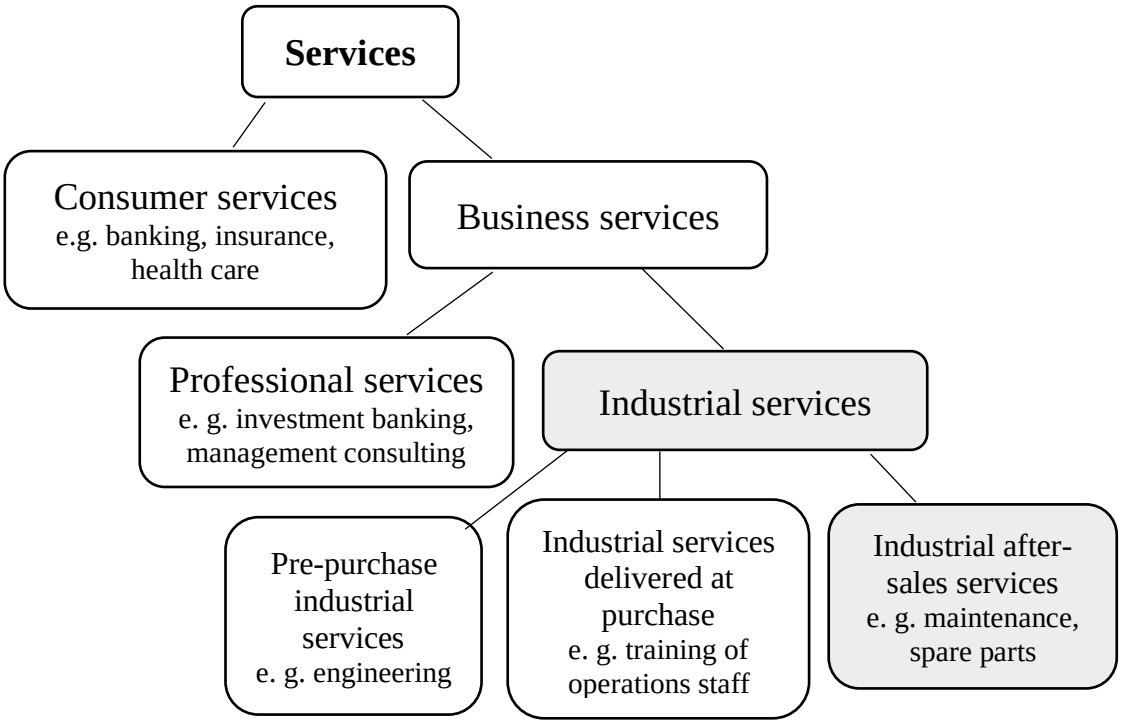

Figure 3. Taxonomy of services (Homburg & Grabe 1999)

Homburg and Grabe (1999) have classified industrial after-sales services as a sub-category of business services and industrial services. In figure 3, industrial services are considered as B2B services that are delivered by manufacturing firms to buying firms. These industrial services can be distinguished from each other through a time perspective: different industrial services are provided in different situations.

In literature, there is no clear definition for industrial services nor the activities that are considered as a part of industrial services. Industrial services have been studied from various perspectives, and this perspective has determined what kind of definition is used in a given context. (Gitzel, Schmitz, Fromm, Isaksson & Setzerd 2016, 2) Some authors have studied industrial services from a market perspective and broadly used industrial services as a synonym for B2B services (e. g. Cooper & de Bretani 1991; Ivens 2005). In process-focused studies, industrial services are considered as all services that support the production process of the customer (Gitzel et al. 2016, 4). Others in turn have emphasized in their definitions the relationship between industrial goods and industrial services (e. g. Johansson 2006). Such definitions assume that industrial services, such as maintenance services, are provided together with industrial goods (spare parts). A common view, especially in earlier literature, has been the IHIP-focused perspective. Such studies utilized the commonly used characteristic criteria (intangibility, heterogeneity, inseparability, and perishability) to distinguish services from goods (e. g. Regan 1963; Zeithaml et al. 1985). Through IHIP criteria, authors have tried to define industrial services and distinguish them from general services. IHIP can be seen as a quite philosophical view to study industrial services. For instance, from the IHIP perspective an issue could be that “is the sales of spare parts classified as a service because they are not intangible?” (Gitzel et al. 2016, 5).

Gitzel et al. (2016) have formalized four categories of how industrial services are defined in literature: market-focused definition, process-focused definition, asset-focused definition, and IHIP-focused definition. In table 1, adapted from Gitzel et al. (2016), used perspectives and earlier studies that define industrial services are presented.

Table 1. Concepts used to characterize and define industrial services (Gitzel et al. 2016, 3)

	Concept			
Author	Market	Process	Asset	IHIP
Jackson & Cooper (1998)	**X**	**X**	**X**	**X**
Morris & Fuller (1989)				**X**
Cooper & de Bretani (1991	**X**			
Boyt & Harvey (1997)				**X**
Homburg & Grabe (1999)	**X**		**X**	
Mathieu (1999)		**X**	**X**	
Oliva & Kallenberg (2003)	**X**	**X**	**X**	
Johansson (2006)			**X**	
Paloheimo, Miettinen & Brax (2004)	**X**	**X**		
Brax (2005)	**X**			
Ivens (2005)	**X**			
Karandikar & Vollmar (2006)		**X**	**X**	
Kowalkowski (2006)	**X**	**X**		
Meier, Roy & Seliger (2010)	**X**		**X**	
Datta & Roy (2011)		**X**		
Ojanen, Ahonen & Reunanen (2011)			**X**	
Reen (2014)	**X**	**X**		

In this thesis, the definition of industrial (after-sales) service is asset-focused. In literature, industrial after-sales services are sometimes used as a synonym for industrial services (Kowalkowski 2006; Oliva & Kallenberg 2003). Industrial after-sales services as a term is not commonly used, but several studies have discussed the closely related topics (Johansson 2006, 20). Homburg & Grabe (1999) presents that industrial after-sales services are one of three different types of industrial services (see figure 3). Comprehensively, after-sales services in the manufacturing field can be seen as activities that occur after the purchase of the product (Saccani et al. 2007, 54). The idea in after-sales services is to provide solutions

that support the product after they are delivered to the customer (Cohen & Lee 1990, 55). Thus, the after-sales services are typically designed to support some fixed asset such as a machine, process, or system that is owned by the customer (Martinsuo et al. 2020, 8).

Johansson (2006) defines industrial after-sales services as a combination of goods and services. He states that after-sales services should be seen as a product that can consist of both service and good elements simultaneously. This product can be a tangible good such as spare parts or consumables, or a service such as field engineering. This view is used as a definition for industrial after-sales services in this thesis. However, since the aim of the thesis is to study procurement function, the main focus is on goods rather than services, because the upstream flow of goods can be considered as the main responsibility of the procurement function (van Weele 2010).

Typically, goods that are categorized as industrial after-sales services are various spare parts and consumables that are delivered to the customer as a part of a maintenance agreement (Johansson 2006). These spare parts can be divided by Fortuin and Martin (1999) into:

1) Repairables, which can be further divided into non-interchangeable or one-of-kind items, and rotables. If a non-interchangeable item is faulty or broken and causes shutdown, the customer has to wait at least the time of the repair work before the system can operate again. Rotable items however can be swapped from the stock and are sent back to the factory or special workshop for repair. When a rotable item is fixed, it can be placed back in the stock and used later when the currently used item breaks down. In the case of rotables, the customer has to wait only for the required time of replacing the item.
2) Non-repairables, which are also called disposables, consumables, throwaway items, or expendables. These items are usually thrown away and removed if they become defective. After that, items are replaced with the ones.

Categorization of the items into repairables and non-repairables can help procurement practitioners to decide how the items are managed in the procurement function. Depending on the type of spare part, optimal inventory management decisions may differ. Thus, the characteristics of the spare parts should be recognized in order that the customers could be served effectively while obtaining the appropriate level of inventory.

2.2 Environment and characteristics of industrial after-sales services

In the manufacturing field, after-sales-related activities have traditionally been viewed as a cost generator and a "necessary evil" (Lele 1997). This way of thinking has been in a change towards the view where after-sales services are rather considered as a source of competitiveness and business opportunity (Armistead & Clark 1992). In the literature of the manufacturing field, several reasons have been found to support the increase of industrial services. These reasons can be broadly divided into three groups: financial, strategic, and marketing. (Gebauer, Fleisch & Friedli 2005, 14)

Financial reasons are mostly related to the lucrativeness of the industrial service business. Profit growth in traditional machinery manufacturing has decreased since the top years of the 20th century. Also, profit margins are found to be higher in an industrial service business. Thus, manufacturers have begun to place emphasis on industrial services in their business. (Wise & Baumgartner 1999; Gebauer et al. 2015, 14) In some manufacturing industries, the after-sales market can be four or five times larger than the market of new products (Bundschuh & Dezvane 2003). Industrial after-sales services and spare parts have also been estimated to generate over three times the turnover of original purchase during the lifecycle of the product (Wise & Baumgartner 1999). Industrial services provide also a more stable source of cash flow compared to traditional machinery selling (Quinn 1992; Oliva & Kallenberg 2003; Gebauer et al. 2005, 14)

Strategic reasons are mainly related to the competitive side of the industrial service business (Anderson & Narus 1995) Industrial after-sales have been found to have an important strategic role in customer satisfaction and retention (Alexander et al. 2002; Armistead & Clark 1992). Also, after-sales activities can help firms to increase the success rate in the case of introducing new products (Goffin & New 2001). Intangible industrial services in turn are more labor dependent and may be difficult to imitate. Hence, the competitive advantage achieved through these services can be seen as more sustainable. (Heskett, Sasser & Schlesinger 1997)

Marketing reasons can be seen as opportunities to increase total sales. Marketing opportunities here are understood as "better service for selling more products" (Mathe &

Shapiro 1993, 33; Oliva & Kallenberg 2003; Gebauer et al. 2005, 149). This means that services can complement the sale of a good or a lease (Mathe & Shapiro 1993, 33). Industrial services can increase the sales of goods. Especially, industrial services which require a high level of customer proximity (e. g. maintenance service) may enhance product sales. (Visnijc Kastalli & Van Looy 2013) Increased customer awareness has also boosted manufacturing firms' willingness to differentiate and improve their range of service offerings in addition to machinery sales (Lay et al. 2010, 716).

In addition to these reasons, several changes in the market environment of the manufacturing field such as globalization along with other macroeconomic factors (Avlonitis, Frandsen, Hsuan & Karlson, 2014), increased competitiveness of emerging countries, and shifts in customer demands have encouraged companies to invest in their after-sales business (Lay et al. 2010, 715-716). Avlonitis et al. (2014, 10) estimated that 71% of global manufacturers are expected to utilize services to differentiate their products, and 82% of European manufacturers will focus on services in their business by 2015.

3. Procurement Function

Novack and Simco (1991) state that procurement is a "complex process that is difficult to define, understand, and manage. To manage a process, it must be understood; to understood the process, it must be defined". In this chapter, the procurement function of the firm is defined. Also, it is argued why procurement operations should be valued as a strategic function in a firm's management. Finally, the characteristics and features of procurement in the industrial after-sales business are discussed.

3.1 Defining procurement operations

Depending on the context, procurement is defined in various ways (Novack & Simco 1991). It can be narrowly defined as buying firm's act to buy goods and services, or broadly as all activities of obtaining goods and services for the organization (Cavinato 1984). However, procurement is a much more complex concept than just buying goods and services. Rather, it is a set of various cross-functional activities that are necessary for the acquisition of goods and services. (Novack & Simco 1991) Van Weele (2010) defines procurement as management of the firm's external resources in order that the supply of all required resources for running, maintaining, and managing the firm's primary and support functions are ensured. These purchased resources depend on the industry and the firm's objectives. For instance, purchased inputs can be raw materials, supplies, consumable items, machinery, laboratory equipment, office equipment, and buildings. (Porter 1985) In short, procurement is responsible for obtaining those external resources that are needed for achieving a firm's goals.

Procurement activities vary depending on the purchasing and supply management strategies of the firm. Procurement activities, such as qualifying new suppliers, purchasing resources, and monitoring supplier performance, have cross-functional elements and serve as an important link between other supply chain operations (Porter 1985; Novack & Simco 1991). Novack and Simco (1991) have identified eleven procurement activities for professionals and academics to use as a framework in the industrial field. These activities are presented in table 2.

Table 2. Identified procurement activities. (Novack & Simco 1991)

ACTIVITY	EXPLANATION
Identify or re-evaluate needs	There must be a reason for the purchase. Typically, a purchase is made to fulfill some need inside the firm. Occasionally these needs should be re-evaluated, because needs change. Once need is identified and adjusted, the procurement process can start.
Define and evaluate user requirements	Once the need is identified, requirements need to be set by measurable criteria. With requirements, procurement professionals can communicate and describe needs to potential suppliers.
Decide to make or buy	Firm must choose whether to make needed input in-house or purchase it. Even though a firm decides to make the input, it often purchases some inputs related to the need from external suppliers.
Identify type of purchase	Identifying whether the purchase is 1) a straight rebuy or a routine purchase, 2) modified rebuy, or 3) a new buy.
Conduct market analysis	To understand the dependencies in buyer-supplier relationships, buying firm must analyze the supplier market. There can be a competitive market (many suppliers), an oligopolistic market (a few large suppliers), or a monopolistic market (one supplier). Depending on the market environment, buying firm can adjust their purchasing strategy.
Identify all potential supplier	Identification process of all suppliers that are able to fulfill the user's needs.
Prescreen all possible sources	Differentiate demands and desires. Demands for a product or service are all critical factors set by the user. Desires are those that are not must-haves, and therefore they are something which can be negotiated about.
Evaluate remaining supplier base	Once all potential suppliers are identified, it must be determined which supplier(s) can best meet the negotiable (desired) requirements of the user
Choose supplier	Choice of the supplier(s).
Deliver product / performance service	Activity occurs with the supplier(s) first attempt to satisfy the user's needs.
Postpurchase / Make performance evaluation	Once a transaction of an input is performed, supplier's performance must be evaluated. The question here is whether supplier has truly met the requirements of the user. If not, the corrective actions should be implemented.

Depending on the environment, activities vary. These identified activities in table 2 however show that procurement can be viewed as a series of decisions that are related to the purpose of acquiring goods and services that are crucial in order that the user's needs can be fulfilled. Thus, procurement should be viewed as a process including several activities.

The purchasing process is often seen as a continuous process (e. g. Monczka, Trent & Handfield 2002; Johnsen, Howard & Miemczyk 2004; Bäckstrand 2014; Van Raaij 2016). A cyclical process model is especially suitable in situations where rebuy is probable. It means that the buying firm has already gained some experience purchasing such items and they have some knowledge about the suppliers on the market (Bäckstrand, Suurmond, Van Raaij & Chen 2019, 5). In figure 4, the cyclical purchasing process by Monczka et al. (2002) is presented.

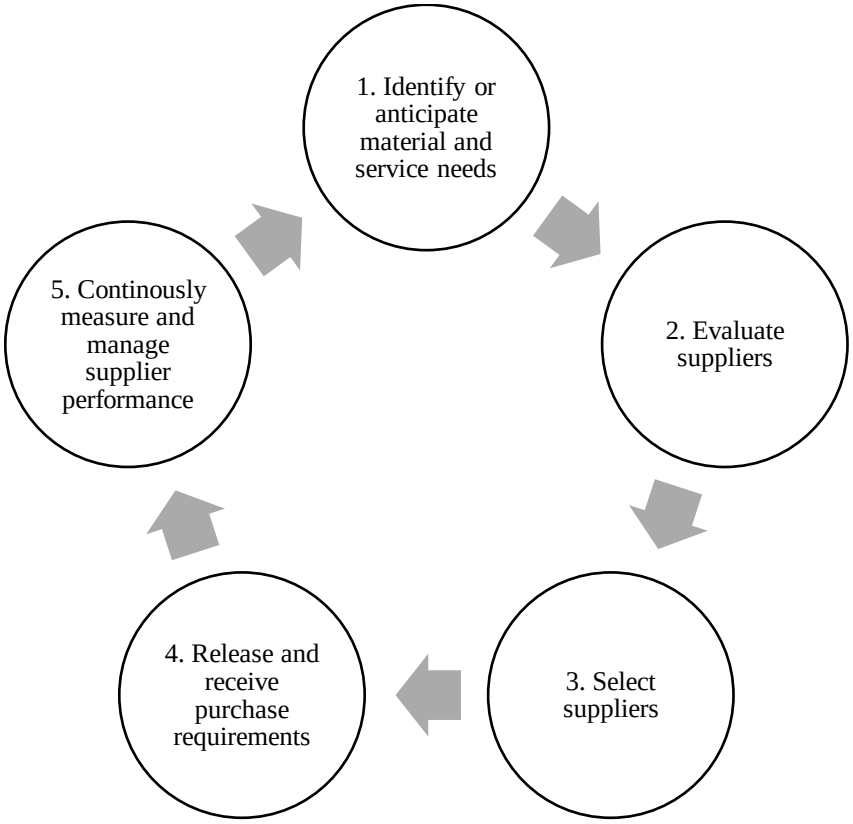

Figure 4. Cyclical purchasing process model (Monczka et al. 2002)

When project-related or other one-off purchase is performed, Bäckstrand et al. (2019, 5) argue that linear process model (fig. 5) can be sufficient. In the linear model, purchasing is

divided into the tactical part (specification, selection, and contracting) and operational (ordering, monitoring, and evaluation) part.

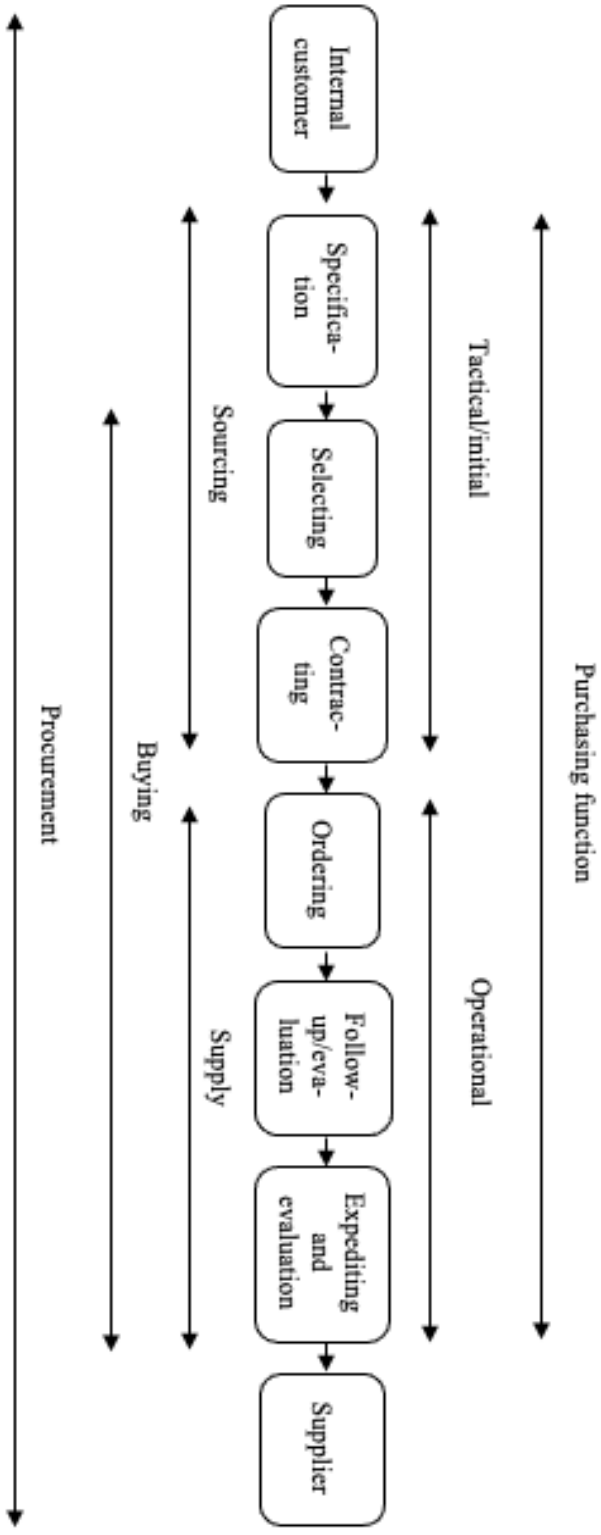

Figure 5. Linear purchasing process model. (Van Weele 2018)

The linear model presented in figure 5, takes into account operational and tactical levels, but not the strategic level. However, it is important to recognize the necessity of a strategic level because it determines the actions performed at the lower levels (Baily, Farmer, Jessop & Jones 2005).

The concept of procurement can be divided into two groups: direct procurement and indirect procurement. In the manufacturing field, the aim of direct procurement is to acquire materials that are used in the production of manufactured goods. (Kim & Shunk 2004, 153) Acquired goods of direct procurement, such as raw materials, plant, equipment, and services, commonly contribute directly to the creation and delivery of the firm's product and/or service that generate revenue (Cox, Chicksand, Ireland & Davies 2005, 42).

Indirect procurement, in turn, is the supplies a firm uses in daily operations, but not in the production of goods that generate revenue. Indirect procurement includes all MRO (maintenance, repair, and operating) items, office equipment, computer and IT equipment, IT software, marketing kits and services, and travel-related services. (Kim & Shunk 2004, 153). These items categorized under the indirect procurement are not contributing directly to the firm's revenue-generating products and/or services (Cox et al. 2005, 42).

In this thesis, the focus is mainly on direct procurement. For instance, if a firm offers maintenance services as industrial after-sales service, it buys (or makes in-house) spare parts from suppliers in order that it can fulfill the need of the customer. These spare parts generate revenue for the firm, so activities aiming to acquire these spare parts can be classified as direct procurement.

3.2 Strategic elements of procurement

The impact of procurement performance on a firm's overall success has been recognized for years (Carter & Narasimhan 1996, 20). Yet, the strategic environment of procurement has been controversial and sometimes questioned (Goebel et al. 2003; Chen et al. 2004; Das et al. 2006; Lawson et al. 2009). In his value chain model, Porter (1985) did not consider procurement as a value-adding function but rather as supporting activity for members of

primary functions. However, several studies from a managerial perspective argue for the strategic side of procurement functions (Nair et al. 2015, 6263).

Depending on the industry, costs associated with procurement or supply management functions are between 30% - 70% of a company's turnover (Quinn 2005). This means that the success of manufacturing firms is heavily influenced by the actions of its procurement function (Lee & Drake 2010, 6651). Thus, procurement has become one of the most crucial functions to manage in the manufacturing field (Sarkis & Talluri 2002) Managers of procurement and supply management functions have also struggled with the supply chain risks such as natural disaster, political crisis (Zsidisin et al. 2005), and most recently COVID-19 pandemic (Shokrani, Loukaides, Elias & Lunt 2020). These challenges have further increased interest in the strategic management of procurement functions (Nair et al. 2015, 6263).

Nowadays, successful management of procurement functions is seen as a source of competitive advantage (Lawson et al. 2009; Monczka et al. 2009). Several studies emphasize the importance of procurement operations to match with the company's overall business strategy (Carter & Narasimhan 1996; Cox 1996; Schoenherr et al. 2014, 30; Lindgreen et al. 2013). Procurement has a significant connecting role between the suppliers and the firm's other functions in creating and delivering value to the external customer (Novack & Simco 1991).

An appropriate style of managing procurement activities requires the alignment with the overall business strategy of the firm (Carter & Narasimhan 1996, 25). In the literature of strategic procurement management, strategic integration and alignment of the procurement activities with the overall business strategy of the firm is seen as a crucial factor. This level of integration and alignment is also referred to as a "fit" or procurement competence. (Baier, Hartmann & Moser 2008; González-Benito 2007; Narasimhan & Das 2001) In this context, fit can be seen as the congruency of the strategic objectives of the firm with the strategic objectives of the procurement function. The role of the procurement function is to pursue these objectives by performing suitable activities (Pohl & Förstl 2011, 231). Hence, strategic procurement can be seen as the strategic integration of procurement into the overall business strategy or supply chain strategy (Lintukangas, Peltola & Virolainen 2009; Yeung 2008).

In order that procurement activities could serve the overall business strategy of the firm, a suitable strategy for procurement operations must be created and implemented. The overall business strategy of the firm sets the guidelines on how the procurement strategy should be designed. The procurement function has its own activities and decisions to make that should support its objectives which, in turn, should support the overall business strategy and objectives of the firm. (Harland 2002, 25)

In management literature, strategy is defined in numerous different ways. Common for these definitions is that it is seen as a set of strategic decisions that differentiate a firm from its competitors (Mazzucato 2002). Porter (1996) state that business decisions are strategic only if they involve consciously doing something differently from rivals in a way that creates a sustainable advantage. Procurement strategy can be defined as a long-term plan, which sets guidelines and frameworks for procurement practices (Anttila, Jussila & Mikkola 2013, 11). For years, the literature field of management has recognized the close connection of strategy, structure, and environment (Hall & Saias 1980, 149). In the context of supply chain management and external resource management, this linkage of strategy, structure, and environment means that a firm's strategy depends on its external supply chain network environment and structure (Chang, Chiang & Pai 2012, 1114). Later in this thesis, this view is used to describe the nature of performance measurement and how metrics should be selected according to the strategy, structure, and environment.

3.3 Characteristics of procurement in industrial after-sales services

Manufacturing firms have widely recognized the opportunity of providing spare parts to offset falling or stagnating revenues and improve profit margins. For instance, in the machine and plant construction industry, the after-sales business can cover 25% of total sales and up to 50% of all profits. (Wagner, Jönke & Eisingerich 2012, 69) Industrial after-sales services may be very critical for the success of high-technology equipment manufacturers. Therefore, meeting the needs of such customers most often requires high quality and short lead time. (Gzara et al. 2014, 53) Industrial firm's increasing interest in after-sales services, especially spare part delivery, place great responsibility on procurement operations in terms of costs and flexibility. If a firm provides spare parts as a service but does not produce them

in-house, the importance of procurement operations and managing supplier relationships can be considered as very high for whole the business.

Managing upstream flow in the industrial after-sales service business, in this case, spare part business, differs from “traditional” business. First, although the overall demand from spare part business may be steadier, demand for individual spare parts is affected by high volatility and fluctuations (Wagner et al. 2012, 70). A lumpy demand for spare parts causes difficulties in forecasting. Common forecasting practices of the demand process may not work well in the context of spare parts and can lead to inaccurate results. (Fortuin & Martin 1999, 954; Morris 2013, 26). A large number of SKUs also causes challenges for forecasting (Morris 2013, 26).

Eventually, the success of a firm’s industrial after-sales business is measured by how well it can serve its customers. In spare part business, the need for an item can be very urgent, for instance, if a defective part causes a shutdown and stock out of spare parts can have serious consequences for the customer’s business (Fortuin & Martin 1999, 953). Hence, the responsiveness of the supply chain can be considered highly important. In addition, suppliers may not guarantee the supply of certain spare parts. Demand for some items can be low and the production may end in some cases. (Fortuin & Martin 1999, 953)

4. Measurement of Procurement Performance

In the context of business and organization management, performance measurement is seen as an activity of measuring the performance of the firm or firm's function by using performance indicators (Lohman et al. 2004, 268). Performance indicator, in turn, is a variable which has a key role when performance measurement is discussed. It expresses quantitatively the effectiveness or efficiency of some activity against a given norm or target value. (Fortuin 1988) In this thesis, a measure is used as a synonym for performance indicator. In addition to the performance indicators, the literature of the performance measurement underlines the importance of the performance measurement system. Performance measurement system refers to practices, procedures, or databases of how performance is measured in the organization. Through a system, performance measurement can be performed in a consistently and completely and complete way. (Lohman et al. 2004, 268)

This chapter considers the theories of these terms. First, the importance and meaning of performance measurement is described. Second, the role of the performance measurement system and performance indicators in performance measurement is defined. The purpose of the thesis is not to build a system or framework for performance measurement but rather analyze what kind of characteristics system or measures could have in the context of the thesis. After general discussion of the performance measurement, terms of the topic are adapted to the context of the procurement.

4.1 Performance measurement

Performance measurement is widely considered as a key activity in the performance management process of organization (Bourne et al. 2003). Even though performance measurement is widely and often discussed, a clear definition of the term has rarely been provided in literature. By its traditional definition, performance measurement is seen as a process which quantifies effectiveness and efficiency of actions. (Neely et al. 1995, 80) However, this definition of Neely (1995, 80) is criticized for lacking managerial guidance on what should be measured and why. The meaning of clear definitions should not be

underestimated because they can help decision makers to focus on the right things. (Moullin 2007, 181) Clear definitions are also important because they can serve as a guide in implementing processes (Gaster 1995, 21). Moullin (2002, 18) states that a more suitable definition for performance measurement is "evaluating how well organizations are managed and the value they deliver for customers and other stakeholders". This definition encourages decision-makers to focus on customers in measuring and managing operations (Moullin 2007, 181). For this reason, the definition of Moullin (2002, 18) is used also in this thesis.

Also, the term "performance" can mean anything depending on the context and the objectives of the organization (Lebas 1995, 29). In this research, performance is mostly seen in the context of procurement. Therefore, in the empirical part of the thesis, performance refers to the efficiency of procurement activities that support the overall business strategy of the case firm.

All organizations measure their performance on some level. The maturity of performance measurement differs between organizations. Some organizations may have very systematic measurement practices while others may use only ad-hoc or superficial measurement. (Parker 2000, 63) Performance measurement activities have been seen as a prerequisite for improving the performance of operations (Lohman et al. 2004, 267). Appropriate performance measurement practices may help firms to understand the consequences of past and future actions (Lebas 1995, 24). Eventually, performance measurement can lead to improved management and performance (Evans 2004, 226). Thus, performance measurement is seen as a basis of management (Lebas 1995, 23).

Lebas (1995, 24) presents five question which can be answered through performance measurement:

- Where have we been? Based on past data, organizations can see the consequences of their actions.
- Where are we now? The current situation of the organization.
- Where do we want to go? Organizations can use performance measurement as a tool to support their strategy.
- How are we going to get there? Organization must use metrics that support their strategy.

- How will we know we got there? By measurement, organization can see whether the targets were met or not.

The aim of these questions is to challenge the thinking of the decision-makers to focus on the most relevant aspects in managing a firm or firm's activity. Through implementing performance measurement, decision-makers can see the outcomes of their decisions and understand better where the current path may lead to. Without performance measurement, it could be difficult to estimate whether the actions done in past have led to the desired outcome.

The benefits of successfully implemented performance measurement practices are evident which has encouraged organizations to perform it. According to Parker (2000, 63-64), following benefits can be achieved through performance measurement:

- Identification of success
- Identification of whether customer requirements are achieved or not
- A better understanding of processes
- Identification of bottlenecks and waste
- Decisions are always based on facts, not on emotions or assumptions
- Confirmation if planned improvements truly happened.

A better understanding of processes and identification of issues and opportunities can be viewed as a by-product of implementing performance measurement because performance measurement requires decision-makers to think about these aspects when performance measurement is systematically executed. Also, performance measurement provides data that helps decision-makers to analyze and understand the consequences of actions done in the past.

An appropriately implemented performance measurement system can create strategic value for the organization. First, metric selection forces organizations to evaluate what is important in their organization. This helps people to understand the mission and strategy of the organization. Second, once objectives are set, frameworks and guidelines for suitable actions that support these objectives are communicated in the organization. Third, when targets are set and measurement has been launched, decision-makers of the organization can follow

from the data whether the path of the organization is right or not. Finally, measures and measurement data can be used to question the strategy of the organization. (Neely 2004, 1020)

Implementing performance measurement is not easy (Neely 2004; Bourne, Neely, Platts & Mills 2002). In fact, according to some claims, 70% of performance measurement (balanced scorecard) implementations fail (McCunn 1998, 34). To avoid failure, two key questions must be answered on managerial level:

1) Why does an organization need measurement? For successful measurement, an organization must understand the core of the measurement and measures. The reason behind measurement must be clear.
2) What does the organization want to measure? The concept of performance must be understood at all organizational levels.

Answers to these questions can be very unique and strongly depend on the culture and context (Lebas 1995, 24).

4.2 Procurement performance measurement

Just like in all operations performance measurement, the appropriate style of measurement in procurement function is highly dependent on the context (Van Weele 1984). First, it is noteworthy to argue why the performance of procurement operations should be measured. As mentioned earlier, decisions made during the procurement processes have a significant impact on a firm's performance on many levels (Carter & Narasimhan 1996, 20). Thus, a strategic approach to procurement management can be considered reasonable and it can be stated that a firm's success is dependent on the level of strategic procurement present in the firm (Carr & Smeltzer 1997; Chen et al. 2004; González-Benito 2007). The level of strategic procurement refers here to the level of alignment and fit between procurement activities and the overall strategy of the firm.

Earlier literature on procurement performance measurement has identified the need for mature procurement performance measurement systems (PPMS) in the context of strategic integration (Dumond 1994; Mentzer & Konrad 1991). In this thesis, this strategic alignment process (figure 6) is seen as a basis for measuring procurement performance.

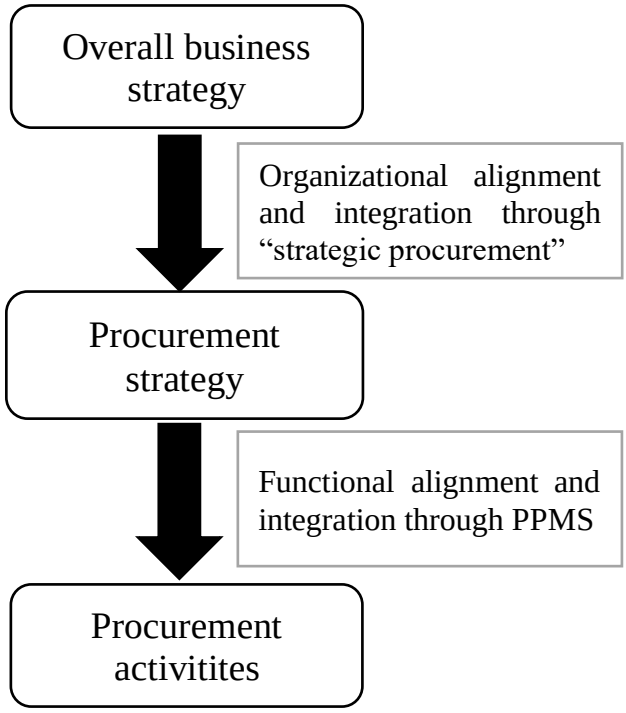

Figure 6. Overview of internal strategic alignment process (Pohl & Förstl 2011, 232).

The key in procurement performance is the "procurement competence" which can be defined as an ability to perform activities that support the overall business strategy of the firm (Baier et al. 2008; Das & Narasimhan 2000; González-Benito 2007). By measuring procurement performance, firms can follow the consequences of their decisions and ensure that their actions are in fit with the procurement strategy which is further created to serve the overall business strategy of the firm.

Procurement performance measurement provides several practical benefits such as resource allocation, communication, and common understanding regarding the state of operations (Chan & Qi 2003, 182-183). It also molds people's behavior and actions through result-based motivation and feedback, enables benchmarks with other organizations, and clearly guides responsibilities inside the function. Above all, it supports data-based decision-making across the procurement function. (Caniato, Luzzini & Ronchi 2014)

4.3 Procurement performance measurement system

Depending on the context, the performance measurement system is defined in various ways (Franco-Santos, Kennerley, Micheli, Martinez, Mason, Marr, Gray & Neely 2007). Neely et al. (1995, 1229) define it as "a set of metrics used to quantify both the efficiency and effectiveness of actions." However, the definition is not giving any managerial implications on how performance measurement should be approached. Simons (2000) takes a broader look in his definition by describing a performance measurement system to be an "information system that managers use to track the implementation of business strategy by comparing actual results against strategic goals and objectives. A performance measurement system typically comprises systematic methods of setting business goals together with periodic feedback reports."

Performance measurement started to gain increasing interest in the late 1970s and early 1980s when traditional accounting systems, which focused mainly on financial performance, were unable to satisfy the need of the decision-makers regarding the state of the firms (Dixon, Nanni & Vollmann 1990). Since then, several authors have developed their frameworks for performance measurement systems. Compared to the traditional measurement system in the late 1970s and early 1980s, these systems also highlighted other non-financial aspects such as quality, customer satisfaction, cycle time, and innovation. (Nudurupati, Bititci, Kumar & Chan, 2010, 281) For instance, maybe the best-known framework, the balanced scorecard by Kaplan & Norton (1992), combined financial measures with perspectives of innovation, customer, and internal processes. The Idea of the non-financial measures is that they can function as leading indicators for financial performance (Ittner & Larcker 1998; Suwingnjo, Bititci & Carrie 1997). Non-financial measures can capture performance dimensions that cannot be viewed accurately from accounting measures in short-term but may indicate financial performance in the long-term (Ittner, Larcker & Randall 2003, 717). For instance, an increase in customer satisfaction can indicate an increase also in revenue.

According to Neely et al. (2005, 1229), performance measurement systems can be studied from three main perspectives (see figure 7):

1) Individual measures

2) The set of measures (i. e. performance system as an entity)
3) The relationship between performance system and the environment

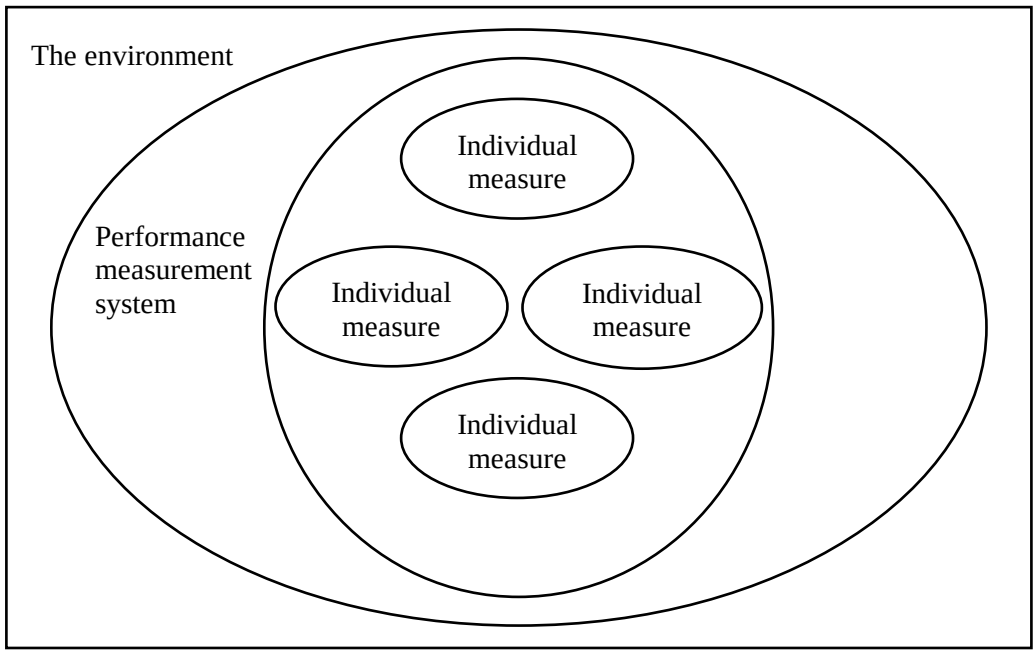

Figure 7. Perspectives of performance measurement system research (Neely et al. 2005, 1229)

Figure 7 represents the framework and the nature of the performance measurement system. It can be seen from the figure that the environment sets the guidelines and framework for the performance measurement system which contains several individual measures that together formalize a set of measures, i.e a performance measurement system or framework. The environment in the context of the procurement can be considered as culture and requirements of procurement function, but above all as the overall business strategy of the firm that set the guidelines for procurement performance measurement.

The Selection of measures is a key step in building a performance measurement system. However, a valid system also requires several other aspects to be taken into account, such as planning the objectives for the measures that support the strategy and managing data collection and analysis processes. (Caniato et al. 2014, 619) Due to this, as a term performance measurement system can be closely linked to the performance management system (Marchand & Raymond 2008). Further, three levels can be separated when performance measurement system is analyzed: structure level, process level, and architecture

level (Caniato et al. 2014, 619-620) Contents of these levels are presented in table 3. In this thesis, the main focus is on structure level, i. e. selection of suitable measures.

Table 3. Levels of procurement performance measurement system in research (Caniato et al. 2014, 620)

Structure (measurement)	**Process (management)**	**Architecture (organization)**
Procurement tree (Fig. 8) - Procurement performance - Internal procurement process - Suppliers	- Design - Role - Data collection/ management - Implementation	- Horizontal - Vertical

4.4. Procurement performance measures

Inappropriate and "unfitting" measures are one of the main causes for the failure of the performance measurement system (Bourne et al. 2002, 1289). It is also recognized as an issue for many performance measurement frameworks, such as balanced scorecard, that they are lacking guidance for measure selection (Neely, Mills, Platts, Richards, Gregory, Bourne & Kennerley 2000). Therefore, measurement selection can be seen as a critical and very challenging task. Appropriate procurement activities vary widely depending on the firm and its strategy (Baier et al. 2008). Firms' business environments and competitive priorities vary widely, which leads to different types of strategic decisions. Different strategies in turn lead to different measures. (Ittner et al. 2003) Hence, it can be argued that business strategy determines the desired level of procurement competence (Pohl & Förstl 2011, 233).

Shortly, the role of procurement performance measures is to support the procurement strategy which is designed to align with the overall business strategy. This strategic alignment is widely recognized as a fundamental prerequisite for the selection of measures (Hudson, Smart & Bourne 2001). More practical criteria for measures are that they should be clear and simple to use, stimulate continuous improvement, and provide quick feedback for the user (Najmi, Rigas & Fan 2005, 114).

Performance measures can be divided into lagging and leading measures. Lacking measures provide information about the outcome, i. e. what has happened. Leading measures, in turn, pursue to predict future outcomes. For instance, customer surveys can function as a leading indicator for customer retention, while customer retention itself is a lagging measure. It is typical that a performance measurement system contains both lagging and leading measures in order that a balanced overview of the performance can be created. (Evans 2004, 222) It is also important to differentiate the meaning of performance indicator and key performance indicator (KPI). Shortly, KPIs are more critical for the success of an organization. Performance indicators can support KPIs by providing information that is important, but not critical for the organization. KPIs should be well-known inside the organization due to their importance. (Parmenter 2015)

Procurement performance can be dependent on two things: internal supply management processes and buyer-supplier relationship (Day & Lichtenstein 2006). Thus, both of these sides should be covered in the procurement performance measurement system. Caniato et al. (2014, 621) state that six dimensions should be distinguished when it comes to measuring procurement performance: cost, time, quality, flexibility, innovation, and sustainability. In figure 8, these dimensions are presented in a framework of procurement performance (procurement tree).

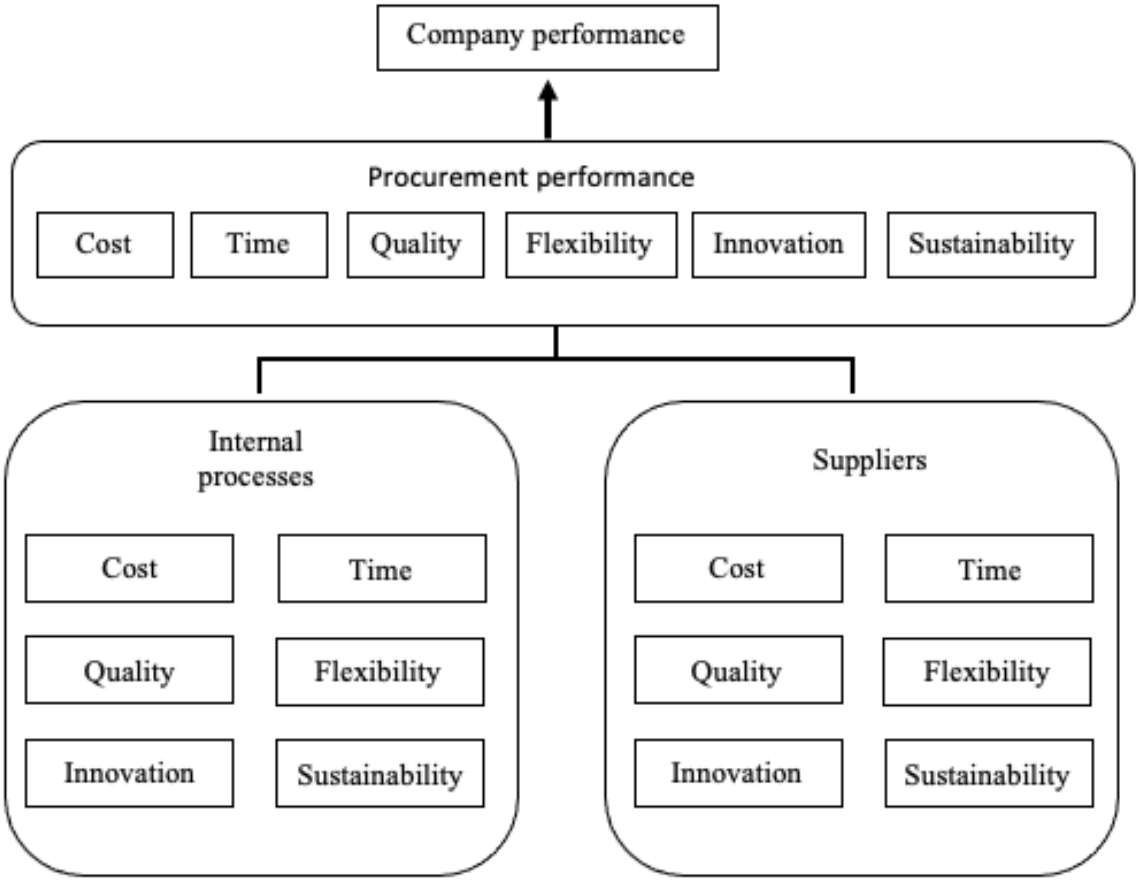

Figure 8. Procurement tree (Caniato et al. 2014, 621)

Figure 8 represents the view of how procurement performance is seen in this thesis. First, as argued earlier through the earlier literature, procurement performance has a direct impact on a company's performance. Second, procurement performance itself is seen as an outcome of how successfully a firm has made decisions about factors (cost, time, quality, flexibility, innovation, and sustainability) that are related to procurement operations. Third, each of these factors can be divided into categories of internal processes or suppliers. For instance, the cost factor (either internal cost or supplier cost) in procurement has an impact on a company's performance because it affects the overall procurement performance.

Van Weele (1984, 21) identifies four dimensions of procurement performance that should be evaluated:

1) Purchasing materials price/cost
    a) Materials price/cost control
    b) Materials price/reduction

2) Purchasing logistics
    a) Adequate requisitioning
    b) Reliability of supplier delivery (supplier lead times and quantities delivered)
3) Quality of purchasing materials
    a) Procurement's predesign involvement
    b) Procurement's post-design involvement
4) Procurement organization
    a) Personnel
    b) Management
    c) Procedures and guidelines
    d) Information systems

These dimensions can be further divided into procurement effectiveness and efficiency. Points 1, 2, and 3 are categorized under procurement effectiveness and point 4 under procurement efficiency. Effectiveness is related to the goals of the procurement function by measuring how well previously set goals were reached. Efficiency can be defined as the relationship between planned and actual sacrifices made during the activities that are pursued to reach the objectives. (Van Weele 1984, 18-19)

5. Research Methodology

This chapter overviews the methodology and the methods used in this thesis. As a term, methodology refers to the planning of the research by introducing what is the target of the study, what methods are used, and what actions are done in the data gathering process (Silverman 2005). Research methods are techniques and procedures that are performed to obtain and analyze the data. In qualitative research, these activities include interviews, questionnaires, and analysis techniques that are performed to receive results that support the aim of the research. (Saunders et al. 2016, 4) The theoretical background of performance measurement and the context of the study were presented in previous chapters while the empirical part pursues linking these theories to a real-life context. Due to the intention to link the theories to a real-life context, a qualitative single case study research method is applied in this thesis.

5.1 Qualitative case study

The aim of the study is to find out the characteristics of procurement operations in a certain context. Through these characteristics, the aim is to understand better what the important factors are. Once characteristics are understood, the target is to link this information to the context of procurement performance measurement and find the factors which should be considered in order that the measurement is performed in a suitable way. As the research area of the procurement in industrial after-sales context can be considered rather underdeveloped, the qualitative research method is used to meet the requirements and objectives of the study, which are mainly focused on revealing new aspects about the topic. With the case study method, the issue of the thesis can be studied in the most appropriate way.

A qualitative research method is recommended when the aim is to understand organizational processes at a deeper level (Bluhm, Harman, Lee & Mitchell 2011, 1870). In qualitative research, data is based on meanings expressed through textual and spoken words and images. Hence, data in qualitative research is often non-standardized and requires categorization (Saunders, Lewis & Thornhill 2016, 569). It is rather difficult to define precisely what

qualitative research is. Therefore, comparing qualitative and quantitative has been a common way to describe the characteristics of both methods. (Erikson & Kovalainen 2008, 4) Perhaps the most typical way to differentiate these two methods is to compare the characteristics of data. Quantitative research is based on numeric data, while data in qualitative research is non-numeric (Saunders et al. 2016, 569). Typically, the aim of qualitative research is to understand issues holistically. Quantitative research, in turn, is more prone to structured and standardized ways of gathering and analyzing empirical data. (Erikson & Kovalainen 2008, 5)

Results of the qualitative research often depend on the context of the study. Generally, it can be said that in qualitative research the focus is on founding or revealing new aspects. (Hirsjärvi, Remes & Sajavaara 2009, 161) Research questions of this thesis emphasize the focus of the study, which is on finding the characteristics of procurement and its measurement in a given context. Therefore, the qualitative research method is seeming to be the suitable method to study the subject.

A case study is a qualitative study where the central idea is to focus on a case or several cases. In a case study, the purpose of research questions is to solve the case by understanding what the important elements are in a given case and what can be learned by studying it. (Erikson & Kovalainen 2008, 115) Case study is a suitable method in a situation where the issue is studied in the context of real-life (Yin 2003). In the field of purchasing and supply management, case studies are seen as an important and effective method for developing theories and providing examples for further studies (Dubois & Araujo 2007, 179). The purpose of the case study is not to generalize the issue but rather it works as a step towards generalization by revealing new information regarding the issue (Stake 2005, 448). In addition, case studies can serve as important complements for quantitative studies by testing theories in a real-life context (Dubois & Araujo 2007, 179).

Because only one company is studied in this research, research follows the designs of a single-case study. According to Yin (2003, 40-41), single-case study is recommended when the examined topic is somehow unique, critical, or revealing. A Single-case study was selected as a research method due to these unique elements associated with the context. As underlined in the theoretical part, managing procurement operations as well as measuring

procurement performance are both activities that are strongly dependent on the context. Measures which support strategy well in one firm may not be appropriate in another firm. Also, since the context of the thesis is only a little-studied in earlier literature, the aim is mainly to find out the characteristics and key success areas in order that a better holistic understanding could be formalized. As a consequence of these, only one firm and its activities are covered in this research.

5.2 Research process and data collection

Qualitative research does not typically follow a strict plan. Rather, amendments and surprises are usual during the research process in most qualitative studies. (Eriksson & Kovalainen 2008, 26) In this thesis, the research process started with a preliminary discussion with the case company. Once the topic was selected, four employees from the case company were asked to participate in the research project through interviews.

Primary data for the empirical part was collected through four semi-structured interviews. The idea of the semi-structured interview method is that interviewees can answer questions in their own words, and therefore there are no options for answers (Eskola & Suoranta 1998). In a semi-structured interview, a researcher has a list of themes and questions regarding key issues discussed during the interview. However, the order of questions can vary, some of the questions can be omitted and additional questions can be presented depending on the situation and the flow of the interview. (Saunders 2016, 391) A semi-structured interview method enables a certain level of flexibility for the interview situation (Farquhar 2012, 73). As the aim of the thesis is to study and reveal context-specific characteristics and measurement aspects of the procurement, the semi-structured interview can be seen as an appropriate interview method. Semi-structured interviews are not limiting interviewees' willingness to express their views, which can be considered as a fundamental approach in a situation where something unique, such as the company's strategy or processes, is studied.

A total of four interviews was conducted at the beginning of February 2021. Due to the Covid-19 pandemic, interviews were held via the Microsoft Teams platform instead of face-to-face interviews. Topics, themes, and preliminary questions were given to all interviewees before an interview (see appendices 1 and 2). In table 3, the list of interviews is presented.

The focus of the first two interviews was on highlighting the aspects of the procurement function (see appendix 1). Through these interviews, the aim was to understand the perspectives of the procurement functions in terms of their role, characteristics, and performance measurement. The two other interviews focused more on the general role of procurement in the supply chain, customer perspective, and industrial service context (see appendix 2).

Table 3. List of interviewees

Name	**Title**	**Length**
Interviewee A	Senior Manager, Procurement	62 min
Interviewee B	Senior Manager, Procurement	55 min
Interviewee C	Manager, Quotation Support	51 min
Interviewee D	Director, Customer Logistics	46 min

All interviewees had a deep knowledge of the procurement operations of the case company. Depending on their current role in supply chain function, and the earlier knowledge and working history, some aspects were emphasized so that the expertise of the interviewees regarding certain topics could be utilized. A semi-structured interview method was thereby utilized, and it was found to be an effective tool in achieving the objectives of the interviewees.

All interviews were recorded and transcribed. After the transcript process, the data were categorized by the different themes. Categorized data were later analyzed and the responses of the interviewees were compared to each other and to the earlier literature. The aim was to draw connections between the responses and the earlier literature. This way it was possible to organize information in a way that enabled the conclusions on the study.

5.3 Case company

Case company provides various sustainable technologies, end-to-end solutions, and services for the minerals processing, aggregates, and metal refining industries globally. It is one of the leading technology providers in these industries. The target in this thesis is to focus on the case company's service unit where they offer various industrial after-sales services such as spare parts, consumables, field engineering, lifecycle services, and modernizations. The case company is operating in over 50 countries while their supplier network encompasses the whole world. Currently, the company has over 15000 employees in about 50 countries. Last year, the case company generated revenue of more than 4.1 billion euros.

In the case of the thesis, the focus is on the procurement function of the case company's service unit. In the service business, the case company has over 100 procurement experts globally. Procurement operations can be divided into operative, tactical, and strategic functions. The responsibilities of these functions are presented in table 4.

Table 4. Procurement responsibilities.

FUNCTION	RESPONSIBILITY
OPERATIVE	- Place purchase orders / Follow-up - Daily supplier interaction on operative issues - Expediting - Measurement of operative issues
TACTICAL	- Handle requests for quotations (RFQ) - Supplier selection on specific spare parts and consumables - Supplier negotiations
STRATEGIC	- Management of supplier pool - Set the strategy for other procurement functions according to the company's strategy - Supplier selection and audits - Measurement of all supplier performance related themes

The strategic level of the procurement function sets the guidelines for the whole procurement function by setting the strategic key points of the procurement operations. It also manages the supplier base and thus is responsible for supplier selection. The tactical function negotiates specific terms of the contracts with the suppliers and selects which suppliers are used in certain items. Finally, on the operative level, purchase orders are made, and the daily issues related to supplier interaction are solved. In addition, follow-up of the deliveries is monitored.

6. Findings and Analysis

In this chapter, the results and findings of the empirical part of the thesis are introduced. Findings are based on the four interviews that were held at the beginning of February 2021. The following findings represent the primary data used in the empirical part of the thesis. Interviewees were able to use their own words in their responses which were seen as a suitable method since the purpose of the thesis is to reveal something new from the context. These responses are categorized and presented in this chapter.

6.1 Industrial after-sales services in case company

First, all interviewees were asked to briefly describe the environment of industrial after-sales services in a case company. Case company's offerings include spare parts, consumables, machinery modernizations, maintenance, shutdown and repair services, and lifecycle services. The responsibility of the procurement function is to obtain parts to support these solutions. The case company is producing some items and spare parts in-house, but most of the spare parts are purchased from external suppliers. Customers of the case company are located all around the world.

All interviewees agreed that industrial services are considered very important for the case company. The main reason for this is that industrial services have been found to generate steady cash flow for the case company. Overall fluctuations of demand are not that great compared to the traditional machinery manufacturing field. Profit margins are also typically higher, for example in the sales of spare parts compared to the sales of machinery. Interviewee A also pointed out that industrial after-sales services are seen as a tool for customer retention. Interviewee D stated that the competition is very hard in the field of the case company. Hence, after-sales services can help in customer relationship management and enhance customer loyalty.

Overall, the industrial services market in the mining industry is seen as rather competitive. To meet this competition, the case company has recognized that fast deliveries, a high level of expertise, trustworthiness, and easiness for the customer are elements that are seen as a

source of competitiveness. Interviewees underline that delivery time and accuracy are especially important criteria that define how well an industrial service provider is performing. Breakdown situations at the customer's site are always very urgent situations, where the spare part supplier's ability to deliver replacement items as fast as possible is considered vital. Interviewees B and D commented on this aspect as follows:

"In a service business, clearly the most challenging characteristic is the urgency of deliveries. Information regarding machinery breakdowns comes sometimes on very short notice which causes pressure to the whole supply chain." – Interviewee B

"Delivery time and accuracy are one of the key success factors in the company's service business. If we fail to identify needed items or delivery time is too long, we lose them [our business opportunities]." – Interviewee D

Another typical situation is a shutdown at the customer's site. Shutdowns are usually planned and scheduled but the role of the case company can be seen as vital. Interviewee C states that if the case company fails to deliver needed items at the right time for the shutdown, the cost of a prolonged shutdown can be hundreds of thousand euros. This kind of failure can cause serious harm to the business and customer relationship.

6.2 The role of procurement organization

The case company has their own procurement functions for different business areas. In a service business, the procurement function is divided into operative, tactical, and strategic levels. The strategic level is responsible for supplier relationships. It audits and selects the suppliers that are used in a service business. The responsibility of strategic procurement is also to ensure that the activities are in alignment with the overall business strategy of the firm. According to interviewee A, this requires top management involvement both at procurement and organization levels. Also, cost control and management of the procurement operations are handled by the strategic procurement. Once the supplier base is determined at the strategic level, the responsibility of the tactical procurement is to negotiate contracts with the suppliers for each item. Operative purchasing, in turn, purchase items and follow the deliveries. Several other activities can be also included in these levels, but the

responsibilities mentioned above can be seen as the primary roles of each level. In figure 9, the main responsibilities of procurement activities are presented in a form of a continuous procurement process.

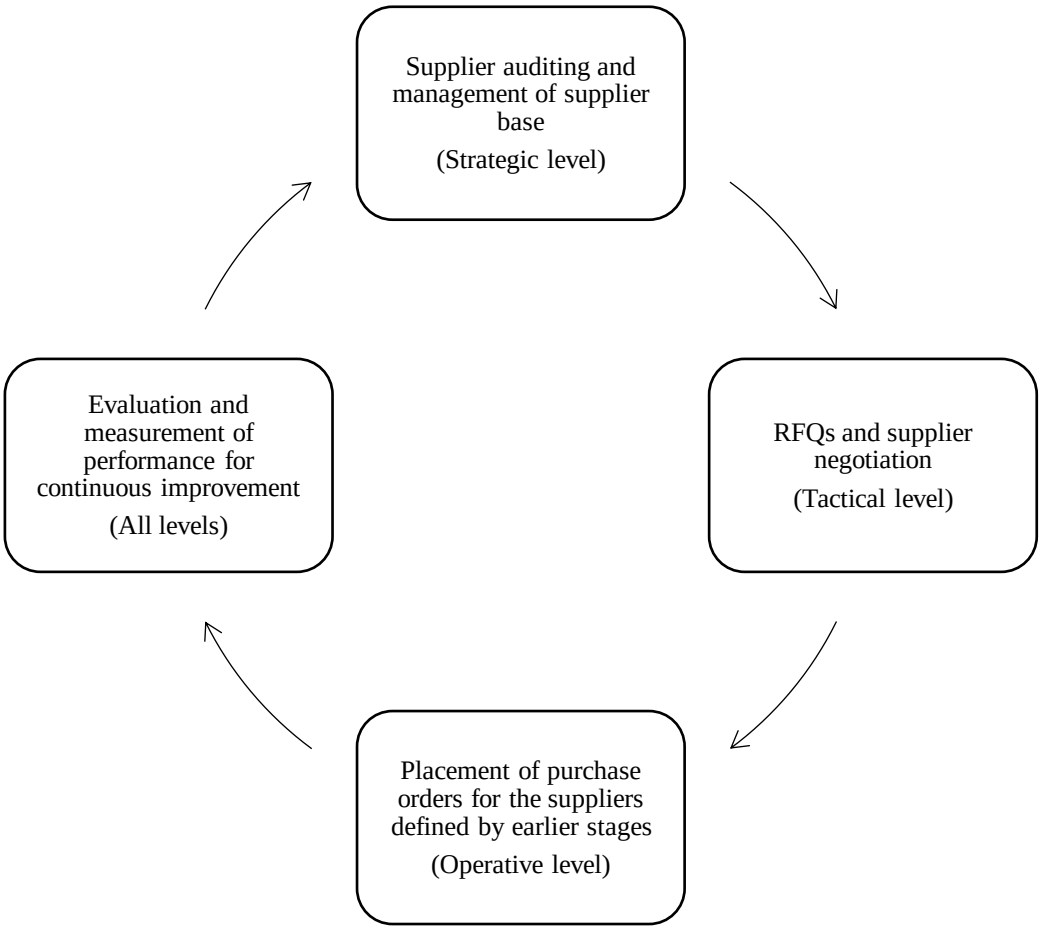

Figure 9. Overview of the procurement activities.

As it can be seen from figure 9, the strategic level defines a lot of activities performed at the other levels. Once the purchase transaction is done at the operative level, the performance of the supplier is evaluated, and the strategic level can adjust the supplier base if needed.

When asked about the role of procurement in the supply chain of the case company, interviewees underline the criticality of procurement performance:

"It is [procurement] one of the key roles of the organization and the supply chain … they have to know precisely what the lead times" - *Interviewee D*

"Relationships with the external suppliers are very important in the spare part business. Thus, strategic procurement is a very critical part of the whole organization" - Interviewee C

In terms of spare parts availability, the case company is heavily dependent on external suppliers. Interviewee B noted that in some strategic product lines case company has its own manufacturing but most of the spare parts are purchased from external suppliers. The urgency of customer deliveries is seen as a common situation in case company's spare parts and consumables business. Since most of the items are purchased from outside, supplier relationship management can be seen as one of the key activities in managing procurement operations.

6.3 Characteristics of spare parts and consumables

The characteristics of the items handled in case company's service business vary widely. According to interviewee B, the size of the smallest items e.g. screws are only a couple centimeters, but the biggest items may be as big as the wall of the small block of house. Also, the technological level of items is varying widely. However, perhaps the most determining aspect of items, in terms of managing industrial service business, is the number of items that are handled in a service business. Interviewee A estimated that the case company has currently over 80 000 active items that are handled in their ERP system. Due to a large number of items, identification and management of all items sometimes cause challenges. In addition, interviewee D pointed out that the volume of some items is very low.

As mentioned earlier in the theoretical part of the thesis, fluctuations in demand for individual items pose many challenges to forecasting (Fortuin & Martin 1999). Interviewees commented on these challenges related to forecasting as follows:

"Compared to machinery manufacturing, forecasting is much more difficult. Undesired surprises at the customer's site are usual, which cause urgent situations. These urgent situations are very difficult to forecast. It underlines the role of supplier relationship management … availability of items should be ensured even before these urgent situations." - Interviewee A

"Demand for some items is very difficult to forecast which causes issues for inventory management." – Interviewee B

In terms of inventory management, volatility of demand, the large number of items, and urgency of orders are seen as a challenging combination. To cover the situation of high volatility in some items, the case company has in-house manufacturing for some critical product lines where it also has the technical know-how to produce high quality. The demand for these items is typically steadier which eases forecasting. However, the situation is quite the opposite for some items that are purchased from the external supplier. Interviewee C mentioned that for some strategic spare parts, which may be critical for the customer's production, stocks are used, but due to a large number of customers, safety stocks are used primarily only for key customers. Interviewee A stated that setting up safety stocks for low-demand items would tie up too much working capital into the inventory.

Interviewee D pointed out that a large number of items also cause issues for item management in ERP system. Since there are so many different items, the identification of specific needs can be difficult. According to interviewee C, customers may not have technical know-how to identify specific needs in certain situations or the technical drawings can be inadequate. Thus, identification of items that should be purchased externally and delivered to the customer requires a lot of technical know-how from the side of the case company. There may also be situations where the customer has independently made some adjustments to the machinery, but the case company or procurement function is not aware of these. According to interviewee C, these situations are very critical because in worst cases the wrong item can break machines and cause unexpected breakdowns.

According to interviews, the accuracy of data regarding the lead times that is set to the ERP system is very important. Due to the large range of different items, the procurement function is unable to constantly update lead times to the ERP system, especially for the items where the demand is low. For instance, if the case company has received a quotation for some item, but the offer has already expired, the case company does not have accurate data about the lead time if an urgent need occurs at the customer's end. Still, if a need at the customer's site is recognized, the purchase order is placed and the delivery timetable is informed to the

customer based on the information of ERP-system, which in this case can be misleading due to the expired offer. Interviewee C confirmed that this is very problematic, but the situation is often very urgent, and customers insist on knowing the delivery schedule as fast as possible. Hence, the delivery time is confirmed to the customer according to the latest offer from the supplier. However, problems occur quickly if the supplier's lead time is increased since the last offer.

6.4 Supplier relationship management

Interviewees describe that due to the large range of various items in the case company's service business, also the supplier base is rather wide. The supplier base is also described as very diverse. First, the case company has active suppliers all over the world. Second, the competencies and capabilities of suppliers vary widely. These factors combined with the characteristics of service business sets their own challenges for the procurement operations.

During the interviews, the respondents pointed out that supplier relationship management is mainly the responsibility of strategic procurement. For instance, at the operative level supplier relations are seen as rather superficial as the buyers solely purchase items but all the negotiations are already finished at the other levels. If some serious challenges are faced at the operative level, they usually are solved in cooperation with strategic procurement.

Results of the interviews clearly indicate that the business environment of the industrial service business sets challenges to manage supplier relationships successfully. According to the results, two main reasons for the difficulties in supplier relationship management are the competitive market environment and the issues caused by a large number of items. The competitive market environment is increasing suppliers' bargaining power since many industrial after-sales service providers are willing to use the same suppliers, i.e. the demand is high from the supplier's point of view. As a consequence of this, the case company is forced to compete with its rivals for the capacity of supplier's production to ensure item availability.

A large number of items itself is not a critical issue in supplier relationship management, but it can be seen as the origin of other challenges. All interviewees mentioned the challenge

related to supplier relationship management. In the situation of the case company, the range of different spare parts and consumables is so large and diverse that a relatively large supplier base is essential to cover all the needs of customers. A large supplier base causes a situation where case company's purchasing volumes per supplier are low. Low purchasing volumes per supplier, in turn, decrease the bargaining power of the case company. Interviewees commented on these challenges as follows:

"A large number of suppliers is a big challenge … Sometimes it may happen that for individual spare part there is defined only one possible supplier but there is not enough volume towards the supplier. Here the supplier relationship can be a bit challenging." – Interviewee A

"Challenge is that there is a large set of suppliers related to service business but the volume and spend per supplier may be very small. Therefore, we may not have enough negotiation power in the buyer-supplier relationship." – Interviewee D

In the context of industrial after-sales service, the lack of bargaining power can be seen as a bit problematic. As mentioned earlier, customers of the case company value fast and accurate deliveries as their top priorities. If the case company does not have enough bargaining power in a situation where the supplier's capacity is limited, issues might occur. At worst, availability challenges of certain items can cause production shutdowns at the customer's site which would cause a lot of harm to the customer relationship. Hence, all respondents mentioned that supplier relationships can be seen as a cornerstone in managing supply chains in the case company's service business.

According to the results, the case company has implemented some activities that are targeted to improve this issue of suppliers' bargaining power. First, interviewee A mentioned that the issue of a large supplier base has been recognized in the case company and the aim is to lower the number of active suppliers. Interviewee B mentioned that it is important to identify these kinds of crucial spare parts and consumables in order that the safety stock can be arranged. The case company also has some cases where it has negotiated with the supplier that it is the supplier's responsibility to reserve a certain level of items in their stock for the case company. If something urgent needs occurs, the case company can use the safety stock

of the supplier. The case company has to pay some compensation to the supplier for this arrangement, but the benefit is that the case company can avoid tying up working capital to its inventory by utilizing the inventory of the supplier.

Interviewees also described that the case company has activities with the suppliers that aim to improve the buyer-supplier relationship. Interviewees A and B mentioned the purpose of the case company is to build partnership-type relationships with some of the key suppliers. The case company has selected a few suppliers into their supplier relationship management program where information is shared mutually. In a situation of the case company, partnership-type relationships can be considered useful, especially if the items that the supplier offers are somehow strategic or if the volume and the total spend are high. In the first case of these, a partnership could improve the case company's ability to provide strategic spare parts and consumables for its customers. In the latter case, partnership-type relationships could mitigate the costs if the case company could increase volumes towards the individual suppliers. Interviewee D pointed out that the case company pursues to improve relations into the partnership-type level especially with the suppliers who share the same values with the case company. Especially sustainability is seen as an important value because suppliers' competence and performance has also impact on the case company's sustainability performance through the supply chain sustainability.

However, partnerships with the suppliers are seen as difficult to build and manage in the environment of the case company. First, due to the fluctuations in demand for individual items, the volumes can be difficult to forecast. Second, due to the characteristics of the spare part business, volumes and total spend per supplier may remain small. Regarding this, interviewee A noted that the main idea of the partnership is to gain mutual benefits. This target can be difficult to reach if the number of transactions is too low. According to interviewee D, supplier-related challenges arise typically if the number of transactions and total spend are low, and due to this the, case company has not named a representative from tactical sourcing to take care of supplier relationship. In these cases, the operative purchasing is handling the supplier relationship on their own and they may not have enough resources because of other daily priorities. However, interviewee D added that the situation is seen better with the supplier relationships where the total spend is higher because the case

company is typically named a representative who looks after all the issues related to the relationship.

According to interviewee A, the case company tries to avoid situations where there is only one possible supplier for an item. In the field of procurement, this kind of situation refers either to single sourcing or sole sourcing. When a company makes a choice to purchase some item or good only from one supplier, even though there are different suppliers at the market, the term single sourcing is used. Among procurement practitioners, single sourcing is seen as a viable strategic decision in some situations depending on the context. (Treleven & Bergman Schweikhart 1988) However, in the context of the case company, the availability of the items is so important for the success of the service business that relying only on one supplier could be too risky. Sole sourcing, in turn, refers to the situation where there is only one possible supplier at the market, so the buyer is forced to purchase goods from this only supplier (Yu, Zeng & Zhao 2009, 790). According to the interviews, there are typically two main reasons why only one supplier is used for an item:

1) There are no other suitable suppliers for an item at the market (sole sourcing).
2) The strategic or tactical level has defined only one suitable supplier for an item because it is seen as a non-priority due to the low volume and/or occasional demand (single sourcing).

For most parts, the case company's procurement pursues defining more than one supplier per item. Sometimes that is difficult or impossible, depending on the item and the supplier market. Relying on one supplier could cause uncertainty and risk for the availability of the item: the supplier's failure to provide item could jeopardize the customer relationship. This uncertainty or risk could be avoided if there would be more suitable suppliers (dual sourcing or multiple sourcing).

"Some items are so-called "hard to source" items, which means that there is only one supplier, and in some cases, this supplier even is the only one who has drawings for the items. In these cases, the supplier owns the patent rights of the item. Thus, we have no other options than use this supplier if we need certain items. The importance of managing these

supplier relationships is significant because if we fail to manage them, we look very bad in the eyes of our customer" – Interviewee B

The purpose of supplier relationship management activities in the case company is to ensure availability of the items that are purchased from the external suppliers. Therefore, supplier selection and the competence of the supplier are critical factors. Interviewee D sums up supplier selection as follow:

"It is important that we can select suppliers that have the ability to supply high volumes when needed, but also suppliers who see us as a valuable customer so that we can have some bargaining power if prices or delivery times need to be negotiated in tight situations" – Interviewee D

6.5 Procurement performance measurement

Regarding procurement performance measurement, the aim of the interview questions was to understand the key elements of measurement in the context of the thesis. Interviewees were asked to describe the level of measurement, challenges, dimensions of measurement, and concrete measures.

In the case company, procurement performance is measured on three levels: operative, tactical, and strategic. Depending on the level, measures vary, but the dimensions that are measured stay fairly similar. Interviewee A mentioned that measurement dimensions of procurement are typically adjusted to match with the overall business strategy but also to support other levels of the procurement function. For instance, operative measures aim to provide information regarding the operative issues for the tactical and strategic levels, and this information can be used in decision-making on these levels.

According to responses, the main dimensions that are measured in procurement function are time, cost, and quality. In addition, sustainability themes are evaluated but not continuously and systematically measured. Measurement of sustainability performance is done rather through outbound logistics operations. Next, features of procurement performance measurement in the case company are introduced.

6.5.1 Procurement performance measurement at the operative level

Results indicate that the most important dimensions of measurement in operative procurement are supplier delivery time and reliability. In addition, quality is measured but its emphasis is not considered as remarkable as the other two dimensions. Time in operative measurement refers to supplier lead time which means the amount of time it takes from the supplier to ship the order after it has received and confirmed it. Reliability, in turn, refers to the accuracy of delivery, i.e. the right quantity is delivered at the right time. In particular, the reliability aspect is highly valued in the service business of the case company due to the customers' needs and preferences. In table 5, the summary of operative procurement measurement is presented.

Table 5. Operative procurement performance measurement

Procurement level	Key dimensions of measurement	Examples of measures
Operative	- Time - Supplier reliability - Quality	- PO validity - Supplier delivery time and accuracy - Customer reclamations

According to interviewee A, perhaps the most critical success factor of the operative level is the efficiency of internal processes. Other procurement functions of the case company are responsible for strategic choices, supplier development, costs, and other procurement-related key activities, while operative procurement is quite solely responsible for the efficient flow of spare parts and consumables. Due to a large number of suppliers, it may be difficult to influence the performance of their supplier's in the short term. Therefore, optimization and improvement of internal processes can be considered important in order to maximize the efficiency of the flow of goods:

"I think it [managing internal processes] is one of the most important elements to focus on in operative purchasing because it is something we can influence independently. There will always be suppliers that cause issues." – Interviewee A

However, respondents mentioned that the measurement of internal processes can be slightly difficult. Operative procurement must ensure that they have resources and tools to purchase goods quickly and efficiently, but continuous measurement can be hard to set. As a leading indicator, the case company uses an order backlog to see if there are any urgent orders from key customers which should be prioritized. Order backlog can be also used to indicate if there are some bottlenecks in internal procurement processes.

As mentioned earlier, supplier performance is a very critical element in the case company's supply chain. Therefore, it is also measured in all procurement levels. One of the key performance measures of operative purchasing is purchase order (PO) validity, which measures the number of late and unconfirmed orders. PO validity measures supplier's ability to manage POs in two ways: 1) supplier's order handling time, and 2) reliability to meet their promises in terms of delivery time. PO validity can be used as both leading and lagging measures. As a leading measure, it may indicate whether the case company will have issues in meeting customer delivery time schedules. On the other hand, it can be used as a lagging measure to evaluate suppliers' performance in terms of delivery time and accuracy, since it simply measures supplier's ability to handle POs and deliver items on time. Further, measures of supplier's operative performance provide data for the strategic procurement regarding the supplier's performance.

Handling quality issues is also one of the measurement dimensions at the operative level. Quality is mostly measured through customer reclamations. In the service business, the case company uses third-party logistics (3PL) provider in warehouse operations. In terms of quality, this leads to a situation where items are only repacked or relabeled in the warehouse, but the staff of 3PL does not have the resources or competence to monitor quality issues. Thus, quality errors are typically not detected until the items have been delivered to the customer. Once quality errors are detected, the operative procurement gathers the information regarding the reclamation and, depending on the situation, reports errors to the strategic level or handles them by themselves with the supplier. Interviewee B has seen this as an issue, but so far, no such major quality errors have been detected that the procedure should be changed urgently. Also, due to a large number of items and the heterogeneity of

items, it would require a lot of resources if the quality of all items were checked in 3PL's warehouse.

6.5.2 Procurement performance measurement at the tactical level

Once the supplier base is set at the strategic level, the responsibility of the tactical procurement is to negotiate contracts with the suppliers. Contents of the contracts (cost and other terms) are mostly evaluated at the strategic level, and therefore tactical procurement focuses mainly on internal processes in their performance measurement. In table 6, the performance measurement of the tactical level is summarized.

Table 6. Tactical procurement performance measurement

Procurement level	Key dimensions of measurement	Examples of measures
Tactical	- Time	- Time of handling RFQ

Like in all other levels of procurement, time is also the most important dimension of performance at the tactical level. According to interviewee B, information regarding the situations at the customer's site, such as shutdowns, comes often on short notice. Once the information about the shutdown is received and all the needs are identified, required contracts are negotiated. From a business point of view, it is important that contracts are agreed quickly. Shutdowns are often critical events at the customer's plant, and customers need information on items' price and availability quickly so that they can budget their operations. To meet this need, tactical procurement aims to handle the process as efficiently as it can. Time of RFQ handling can be considered to measure both internal processes and suppliers' performance because both affect its outcome.

6.5.3 Procurement performance measurement at the strategic level

According to the interviewees, the strategic level of procurement includes most measurement activities. The reason for this is that the supplier relationships, which are the key aspect of the procurement in the case company's service business, are managed at the

strategic level. Dimensions of measurement are the same as at the operative level, but the perspectives are slightly different. In table 7, strategic procurement performance is summarized.

Table 7. Strategic procurement performance measurement

Procurement level	Key dimensions of measurement	Examples of measures
Tactical	- Time - Supplier reliability - Quality - Cost - Sustainability	- Delivery time - Delivery accuracy - Customer reclamations - Total spend per supplier - Payment terms

At the strategic level, performance measurement is more comprehensive. Some dimensions are added, and more individual measures are used compared to the other levels. Also, supplier performance is evaluated more deeply which can be seen as the main responsibility of the strategic procurement. The objective of the supplier performance measurement is to evaluate suppliers' competence so that the availability of the items can be ensured. This can be seen as an act of supplier risk management. Supplier performance measurement also aims to identify risks and opportunities related to the suppliers. For instance, if a supplier is performing well according to the measures, a deeper relationship can be considered if needed.

Results show that the dimensions of time and supplier reliability are highlighted also in strategic procurement performance measurement. Also, the quality of the items is evaluated more thoroughly. Since strategic procurement is responsible for the supplier base, measures of these dimensions are mainly focused on supplier performance. Supplier's performance is continuously evaluated through the measures in strategic procurement, which enables feedback and possible development actions.

Dimension of cost, in terms of continuous performance measurement, is analyzed mainly at the strategic level. Spend per supplier provides information regarding the magnitude of the

buyer-supplier relationship, which can be seen as critical information if partnership-type relationships are being considered. If the total spend is too low, a deeper relationship is unlikely to achieve significant mutual advantages. In addition, the sustainability dimension is measured at the strategic level. However, interviewee D noted that sustainability measurement is focused mostly when supplier auditing is done in the supplier selection phase. Case company's continuous measurement activities of sustainability in procurement functions are limited. According to interviewee D, sustainability themes are better taken into account in customer logistics and overall supply chain management than in procurement function.

Example measures presented in table 7 can be considered as lagging measures. They measure past transactions and evaluate how well the supplier performed. Compared to the operative measures, strategic measures are following trends over a longer time period while operative measures tend to focus more on current performance. The number of transactions per supplier can vary, depending on the demand of the item they provide and therefore a longer time perspective is needed for proper evaluation. According to interviewee A, there are however some similarities between the measures of different levels. For instance, a supplier's delivery accuracy is measured mainly on the operative level, but the information is used in decision-making at all levels.

According to interviewee A, the strategic level of the procurement defines the characteristics of the whole procurement function. In cooperation with the top management of the services unit, strategic procurement determines the dimensions that are important for the procurement function. Thus, these key success factors function as the guiding elements for the performance measurement and further for individual measures, i.e. strategic procurement defines what should be measured and how.

6.6 Summary of the findings

The first goal of the interviews was to find out the characteristics of the procurement function in the case company's industrial services unit. This study is based on the view that the identification of the characteristics can help the decision-makers to understand the environment and context of their business. The second goal of the interviews was to reveal

how procurement performance measurement is performed in the case company. Procurement performance measurement practices were also tied into the context of the industrial after-sales services. In addition, the effects of the environment and the context on procurement performance measurement were discussed during the interviews.

The results of the interviews underline the challenges that the case company faces in their procurement operations in a service business. According to the results, the nature of the spare parts and consumables cause issues. Features of the items vary widely which extends the supplier base because the case company is required to obtain items from various technical fields. A large supplier base causes issues for supplier relationship management because the number of transactions and the total spend per supplier remains low. In addition, the urgency of the case company's customer deliveries challenges the procurement function to expedite the supplier deliveries. A short lead time is often preferred which puts pressure on the suppliers. Therefore, suppliers' competence is highly critical for the case company, especially in terms of delivery time and accuracy.

These characteristics are reflected in the measurement of procurement performance. From the perspective of internal processes, time and efficiency are valued in especially at the operative and tactical levels, and those dimensions are measured systematically through various metrics. From the perspective of supplier competence, time is also measured through the delivery time metrics. In addition, suppliers' competence is evaluated in terms of delivery reliability, quality, cost, and sustainability. Especially, the dimension of supplier delivery reliability was underlined in the case study.

In conclusion, it can be argued that the measurement is relatively well in alignment with the environment. Operative, tactical, and strategic metrics provide useful information regarding procurement operations as they mostly focus on the key success factors of the service business. However, interviews did not provide information on whether the procurement plan aligns with the overall business strategy of the firm. For instance, the sustainability aspect, which is highlighted in the overall strategy of the company, was not evaluated continuously and thoroughly in the procurement function. Though, this does not necessarily refer to poor strategic alignment with the overall business. Instead, the reason for this may be that the maturity of the procurement function is not yet that high which means that some aspects of

the procurement function are not so advanced. In addition, some dimensions may be difficult to measure continuously in the context of industrial after-sales services.

7. Discussion and Conclusion

In this thesis, procurement characteristics and performance measurement were examined in the context of industrial after-sales services. The purpose of the study was to deepen the understanding of the relationship between the environment and the procurement function in the context of industrial after-sales services by identifying the characteristics and analyzing appropriate procurement performance measurement elements. In the theoretical part, key concepts of the thesis were discussed and aligned into the environment of industrial after-sales services. It was found that the strategy and environment define the view for suitable strategic management of procurement activities, including performance measurement. In addition, the role of the procurement function and the increased interest in industrial services were analyzed on the basis of earlier literature.

In the empirical part, a single-case study was conducted in cooperation with the case company. The empirical part examined the topic in the context of real-life. Primary empirical data for empirical research were gathered through four semi-structured interviews conducted in early February 2021. Interviews aimed to reveal the state of procurement and procurement performance measurement in the context of the case company's service unit to achieve a holistic understanding of the characteristics, key success factors, and performance measurement. Due to the nature of qualitative case studies, empirical research seeks to function as a step towards generalization by providing new and thoroughly structured information.

7.1 Discussion on the findings

From the single-case study of the thesis, we can draw conclusions on the characteristics of the procurement function in industrial after-sales services. First, as mentioned in the theoretical part, the demand for individual spare parts can be unsteady (Wagner et al. 2012, 70). This was also found in the empirical study as the interviewees mentioned the difficulties of forecasting due to the fluctuations of demand. Earlier literature has also pointed out that a large number of SKUs can causes challenges for forecasting (Morris 2013, 26). The wide range of various items was seen as an issue also in the study of the thesis. In fact, the results

of the study indicate that most of the challenges faced in the case company's procurement function were somehow related to a large number of various items.

Even though the earlier literature and the empirical study of the thesis showed that the environment of industrial after-sales services is challenging, there are many lucrative and strategic elements that are related to it. According to the interviews, elements such as customer retention, steady cash flows, and high profit margins are reasons why industrial services are valued as a vital business line. These factors were in alignment with the previous literature of the field (e.g. Alexander 2002; Armistead & Clark 1992). Overall, industrial after-sales services are a source of competitiveness for many manufacturing firms. Therefore, management of the procurement function in a given business can be seen as highly important.

Dimensions of time and reliability, in terms of supplier deliveries, and performance measurement were emphasized in the empirical study of the thesis. These aspects are not necessarily the most critical dimensions in traditional machinery selling business, but in the context of the thesis, they were highly valued. The reason for this is that the business model of industrial after-sales services requires companies to focus on these aspects so that they could serve their customers successfully. Thus, it can be argued that the environment of the organization effects on how procurement performance measurement is implemented in the organization. This aligns with the perspectives Neely et al. (2005, 1229) regarding the relationship between the environment and the performance measurement.

Even though the procurement tree of Caniato et al. (2014, 621) included the dimensions of flexibility and innovation as the key dimensions of the procurement performance, the empirical study of the thesis did not find these aspects as critical in the context of industrial after-sales services. Also, quality and sustainability were not emphasized in the context of the thesis, even if they were measured on some level. This indicates that in spare parts and consumables business, time and reliability of the supplier deliveries are the most critical factors to evaluate. However, the nature of the single-case study limits the reliability of the study and especially generalization. Therefore, it is impossible to provide clear answers for the optimal procurement performance measurement.

7.2 Answering the research questions

The objectives of the thesis could be divided into two parts. First, the characteristics and key success factors of procurement were examined. Second, procurement performance measurement was studied in the given context of the thesis. Next, the results of the research are analyzed by answering the research questions.

"What are the special characteristics of procurement functions in the industrial after-sales service business?"

Findings of the empirical research indicate that the nature of items defines the characteristics of the procurement in the industrial after-sales service context. Spare parts and consumables include items from large a range which typically requires a large supplier base. This in turn set its own challenges for supplier relationship management. Also, customer needs are often urgent. As a consequence, a procurement function is required to ensure quick and accurate deliveries from external suppliers. On the basis of the interviews, at least the following characteristics can be identified when procurement is discussed in the context of industrial after-sales services:

1) A large number of diverse items to meet all customer needs
2) Large supplier base due to the high diversity of the items
3) Supplier relationships are difficult to deepen
4) Bargaining power is important for the buyer, yet difficult to achieve
5) Fluctuations in demand for individual items are high, which causes issues for the forecasting
6) Customers' urgent needs are common, which underlines the importance of items availability and suppliers' on time deliveries
7) The role of procurement is critical for the overall success of the business unit.

The findings above can be seen as the characteristics that differentiate procurement of spare parts and consumables from the procurement of machinery manufacturing, even though there may be similarities depending on the industry. According to the interviews, a wide range of various spare parts can be seen as the root cause for the challenges that the

environment sets for procurement operation management. Due to a large number of diverse items, a large supplier base is needed. In this case, a large supplier base cause issues for the supplier relationship management, because the total spend per supplier remains low. This poses challenges for building a deeper relationship because the supplier is unable to gain financial benefits if the number of transactions cannot be increased. A low number of transactions between the supplier and the case company also has a negative effect on the case company's bargaining power. Finally, customer needs are often urgent, and as most of the items are obtained from external suppliers, the suppliers' ability to deliver items on time is critical.

"*What are the key success factors of procurement functions in the industrial after-sales service business?"*

Several studies have underlined the need for purchasing function to align with the business strategy of the firm (Carter & Narasimhan 1996; Cox 1996; Schoenherr et al. 2014, 30; Lindgreen et al. 2013). Due to the consensus of several earlier research, there is no need to present any different views regarding the role of the procurement function: it should be managed in a way that supports the overall business strategy of the firm (or business unit). Often this means that the procurement function is responsible for obtaining items in order that the customers' needs could be met. In the industrial after-sales service business, this requires that the availability of spare parts and consumables can be ensured in all situations. Thus, in terms of procurement, the key success factors according to the results are:

1) Suppliers' ability to deliver goods quickly and accurately without quality errors
2) Buyer firm's ability to achieve bargaining power
3) Accuracy of demand forecasts

Results of the empirical research show that these three factors cause most of the challenges for the case company's procurement function which indicate that they are somehow important for the organization. Also, results indicate that these factors are important because they have a significant impact on the success of the case company's service business. Therefore, these factors can be considered as the key success factors of the procurement

function. The success of these matters can be seen to have a significant positive impact on business success.

As we can see from the identified key success factors, supplier relationship management plays a huge role in procurement functions. Interviews pointed out that the case company uses mostly external suppliers in their service business. Hence, the supplier's performance impacts directly the case company's business. Therefore, bargaining power can also be considered an important factor. In addition, accurate forecasts can help the buyer firm to decrease their dependency on suppliers' quick and accurate deliveries in urgent situations. If the buyer firm could forecast more accurately, it could use inventories more efficiently. However, as the interviews noted, this is considered very difficult due to the fluctuations of demand.

"Which procurement performance dimensions are important to measure in the industrial after-sales service business?"

First, procurement performance measurement should be set to support the management of procurement activities. KPIs in turn should be selected to measure the most critical factors, which in this context are related to the supplier's performance. As Caniato et al. (2014) presented, procurement performance measurement can be divided into internal processes and supplier performance. Results indicate that the key dimensions of internal process measurement in procurement are mainly related to time and efficiency. Procurement organizations can follow for instance the order backlog and ensure that all orders are handled as quickly as possible. Other dimensions of performance measurement were not emphasized that much in terms of internal processes.

Instead, in industrial after-sales services, the main focus of procurement performance measurement is on the measurement of suppliers' performance. It can be argued that the impact of suppliers' competence is evident and critical in the case company's service business. Results indicate that to meet its customers' needs, it is highly dependent on its suppliers' performance. Especially in terms of "hard to source" items, individual suppliers' competence is critical. Therefore, the key dimension of performance measurement is delivery accuracy, which refers to the supplier's ability to deliver the right items on time.

Responses of the interviewees show that this dimension is measured in all levels of the procurement organization. Other important dimensions are quality, cost, and sustainability. However, results show that there is clearly less emphasis on measuring these dimensions.

7.2 Managerial Implications

From a managerial point of view, this study suggests that organizations operating in industrial after-sales services should analyze their procurement activities critically. If a firm is using mainly external suppliers in their industrial after-sales service business, the role of procurement should be considered critical. Further, firms operating in spare parts and consumables business should understand their dependencies on suppliers and recognize opportunities to gain bargaining power. These factors can be seen as the key success factors in managing procurement operations in such an environment. To tackle this challenge of lacking bargaining power, firms should seek opportunities for creating partnership-type relationships, if mutual, mainly financial, benefits can be achieved. If the buyer firm can ensure its position as a "favorable customer" in the eyes of a key supplier, it may have a positive effect on the performance of the firm's service business through better availability of items in challenging situations.

Study shows that it can be difficult to have an impact on supplier's performance due to the lack of bargaining power. Therefore, procurement practitioners should make sure that their internal processes are working efficiently. Especially efficient procedures in operative purchasing, quotation management, and supplier selection can be considered important. Also, due to the difficulties in forecasting demand for spare parts and consumables, firms could achieve a competitive advantage if they manage to create forecasting systems that can be utilized effectively in inventory management.

In terms of procurement performance measurement, the importance of strategic alignment between procurement and the overall business strategy should not be underestimated. Each firm must understand its own key success factors, and these factors should be emphasized in performance measurement. Due to the complexity of technology in the modern industrial field, cross-functional communication is important. As earlier studies have found, systematic performance measurement can help organizations to improve communication (Chan & Qi

2002) and mold behavior for desired directions (Neely et al.1995). Therefore, the study suggests that the measurement should be systematic in all procurement levels so that the objectives and key factors can be truly understood all around the procurement function. This could also improve cross-functional communication.

7.3 Limitations and future research

The aim of the performance measurement process is to understand the current state of the organizations (Ishaq Bhatti et al. 2014, 3217). This can help organizations to improve their competitiveness with the help of data-based decision-making. However, performance measurement can be viewed very differently depending on the context. Therefore, before further research, results can be seen to apply only in this context. However, it is noteworthy that on some occasions, the results of the case study can be transformed to other contexts (Eskola & Suoranta 1998). The single-case study research method also limits the implications since the data is conducted through interviews from one company. Therefore, the results of the case study are difficult to generalize. Thus, this study uses Stake's (2005, 448) view of the ability of case studies to act as a step towards generalization.

To improve the maturity of the study field, more studies with the context of procurement in industrial after-sale services are needed. This thesis focused tightly on the case company's situation, which limits the generalizability of the results. Thus, broader research with different industries is suggested in order that the characteristics of the field could be understood more thoroughly. Especially in terms of procurement performance measurement, the maturity of a firm's procurement function defines how the performance measurement is understood and executed. Hence, to understand the procurement performance and its dimensions, a suggestion for future research would be to study firms with different maturity of the procurement function. This way, a more advanced understanding of the procurement performance measurement in the context of industrial after-sales services could be achieved.

References

Akyuz, G. A. & Erkan, T. E. (2010) Supply chain performance measurement: a literature review. *International Journal of Production Research* 48, 17, 5137–5155.

Alexander, W. L., Dayal, S., Dempsey, J. J. & Vander Ark, J. D. (2002) The secret life of factory service centres. *The McKinsey Quarterly* 3, 106–115.

Anderson, J. C. & Narus, J. A. (1995) Capturing the value of supplementary services. *Harvard Business Review* 73, 3, 75–83.

Anttila, J-P., Jussila, A., & Mikkola, M. (2013) Hankintatoimen kehittäminen pk-yrityksissä. VTT Technical Research Centre of Finland. *VTT Technology* 81.

Armistead, C. & Clark, G. (1992) Customer service and support. Implementing Effective Strategies. London, FT Books, Pitman Publishing.

Avlonitis, V., Frandsen, T., Hsuan, J. & Karlsson, C. (2014) Driving competitiveness through servitization: A guide for practitioners. Frederiksberg, The CBS Competitiveness Platform.

Baier, C., Hartmann, E. & Moser, R. (2008) Strategic alignment and purchasing efficacy: an exploratory analysis of their impact on financial performance. *Journal of Supply Chain Management* 44, 4, 36–52.

Baily, P., Farmer, D., Jessop, D. & Jones, D. (2005) Purchasing principles and management. 9th ed. Harlow, Financial Times Prentice Hall.

Bluhm, D., Harman, W., Lee, T. & Mitchell, T. (2011) Qualitative research management: a decade of progress. *Journal of Management Studies* 48, 8, 1866-1891.

Bourne, M., Neely, A., Platts, K. & Mills, J. (2002) The success and failure of performance measurement initiatives: Perceptions of participating managers. *International Journal of Operations & Production Management* 22, 11, 1288–1310.

Bourne, M., Neely, A., Mills, J. & Platts, K. (2003) Implementing performance measurement systems: a literature review. *International Journal of Business Performance Management*, 5, 1, 1-24.

Boyt, T. & Harvey, M. (1997) Classification of industrial services: A model with strategic implications. *Industrial Marketing Management* 26, 4, 291–300.

Brax, S. (2005) A manufacturer becoming service provider - challenges and a paradox. *Managing Service Quality* 15, 2, 142–155.

Brewer, P. C. & Speh, T. W. (2000) Using the balanced scorecard to measure supply chain performance. Journal of Business Logistics 21, 1, 75-93.

Bundschuh, R. G. & Dezvane, T. M. (2003) How to make after sale services pay off. *The McKinsey Quarterly* 4, 116–127.

Bäckstrand, J. (2014) Using the interaction life cycle in an educational setting. Proceedings of the 23rd Annual IPSERA Conference, 13-16 April, Pretoria, South Africa.

Bäckstrand, J., Suurmond, R., van Raaji, E., and Chen C. (2019) Purchasing process models: Inspiration for teaching purchasing and supply management. *Journal of Purchasing and Supply Management* 25, 5, 1-11.

Carr, A. S. & Smeltzer, L. R. (1997) An empirically based operational definition of strategic purchasing. *European Journal of Purchasing & Supply Management* 3, 4, 199–207.

Carter, J. R. & Narasimhan, R. (1996) Is purchasing really strategic? *International Journal of Purchasing and Materials Management* 32, 4, 20–28.

Caniato, F., Luzzini, D. & Ronchi, S. (2014) Purchasing performance management systems: an empirical investigation. *Production Planning & Control* 25, 7, 616-635.

Cavinato, J. L. (1984) Purchasing and material management. St. Paul, West.

Chan, F. T. & Qi, H. J. (2002) Feasibility of performance measurement system for supply chain: a process-based approach and measures. *Integrated Manufacturing Systems* 14, 3, 179-190.

Chang, C-W., Chiang, D. M. & Pai, F-Y. (2012) Cooperative strategy in supply chain networks. *Industrial Marketing Management* 41, 7, 1114–1124.

Chen, I. J., Paulraj, A. & Lado, A. A. (2004) Strategic purchasing, supply management, and firm performance. *Journal of Operations Management* 22, 505–523.

Cohen, M. A. & Lee, H. L. (1990) Out of touch with customer needs? spare parts and after sales service. *Sloan Management Review* 31, 2, 55.

Cooper, R. G. & de Brentani, U. (1991) New industrial financial services: what distinguishes the winners. *Journal of Product Innovation Management* 8, 2, 75–9.

Cova, B. & Salle, R. (2008) Marketing solutions in accordance with the S-D logic: Co-creating value with customer network actors. *Industrial Marketing Management* 37, 3, 270-277.

Cox, A. (1996) Relational competence and strategic procurement management. *European Journal of Purchasing and Supply Management* 2, 1, 57–70.

Cox, A., Chicksand, D., Ireland, P. & Davies, T. (2005) Sourcing indirect spend: A survey of current internal and external strategies for non-revenue-generating goods and services. *The Journal of Supply Chain Management* 41, 2, 39-51.

Das, A. & Narasimhan, R. (2000) Purchasing competence and its relationship with manufacturing performance. *Journal of Supply Chain Management* 36, 2, 17–28.

Das, A., Narasimhan, R. & Talluri, S (2006) Supplier integration: Finding an optimal configuration. *Journal of Operations Management* 24, 5, 563–582.

Datta, P. P. & Roy, R. (2011) Operations strategy for the effective delivery of integrated industrial product-service offerings: Two exploratory defence industry case studies. *International Journal of Operations & Production Management* 31, 5, 579–603.

Day, M. &Lichtenstein, S. (2006) Strategic supply management: the relationship between supply management practices, strategic orientation and their impact on organizational performance. *Journal of Purchasing and Supply Management* 12, 6, 313–321.

Dixon, J. R., Nanni, A. J. & Vollmann, T. E. (1990). The new performance challenge: Measuring operations for world class competition. Homewood, Illinois, Dow Jones–Irwin.

Dubois, A. & Araujo, L. (2007) Case research in purchasing and supply management: opportunities and challenges. *Journal of Purchasing and Supply Management* 13, 3, 170-181.

Dumond, E. J. (1994) Moving toward value-based purchasing. *International Journal of Purchasing and Materials Management* 30, 2, 2–8.

Eriksson, P. & Kovalainen, A. (2008) Qualitative methods in business research. London, Sage Publications.

Eskola, J. & Suoranta, J. (1998) Johdatus laadulliseen tutkimukseen. Tampere, Vastapaino.

Evans, J. R. (2004) An exploratory study of performance measurement systems and relationships with performance results. *Journal of Operations Management* 22, 3, 219–232.

Farquhar, J. D. (2012) Case study research for business. 1st ed. London, Sage.

Fawcett, S. E. & Cooper, M. B. (1998) Logistics performance measurement and customer success. *Industrial Marketing Management* 27, 341–357.

Fortuin, L. (1988) Performance indicators—Why where and how? *European Journal of Operational Research* 34, 1, 1–9.

Fortuin, L. & Martin, H. (1999) Control of service parts. *International Journal of Operations & Production Management* 19, 9, 950-971.

Franco-Santos, M., Kennerley, M., Micheli, P., Martinez, V., Mason, S., Marr, B., & Neely, A. (2007) Towards a definition of a business performance measurement system. *International Journal of Operations & Production Management* 27, 8, 784-801.

Gaster, L. (1995) Quality in Public Services. Buckingham, Open University Press.

Gebauer, H., Fleisch, E. & Friedli, T. (2005) Overcoming the service paradox in manufacturing companies. *European Management Journal* 23, 1, 14–26.

Gebauer, H., Gustafsson, A. & Witell, L. (2011) Competitive advantage through service differentiation by manufacturing companies. *Journal of Business Research* 64, 12, 1270–1280.

Gitzel, R., Schmitz, B., Fromm, H., Isaksson, A. J. & Setzerd, T. (2016) Industrial services as a research discipline. *Enterprise Modelling and Information Systems Architectures* 11, 4, 1-22.

Goebel, D. J., Marshall, G. W. & Locander, W. B. (2003) Enhancing purchasing's strategic reputation: Evidence and recommendations for future research. *The Journal of Supply Chain Management* 39, 1, 4–14.

Goffin, K. & New, C. (2001) Customer support and new product development. *International Journal of Operations and Production Management* 21, 3, 275–301.

Goffin, K. Lemke, F. & Szwejczewski, M. (2006) An exploratory study of `close' supplier-manufacturer relationships. *Journal of Operations Management* 24, 2, 189-209.

González-Benito, J. (2007) A theory of purchasing's contribution to business performance. *Journal of Operations Management* 25, 4, 901–917.

Grönroos, C. (1990) Service management and marketing: Managing the moments of truth in service competition. Lexington, Lexington Books.

Gunasekaran, A. & Kobu, B. (2007) Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995–2004) for research and applications. *International Journal of Production Research* 45, 12, 2819–2840.

Gzara, F., Nematollahi, E. & Dasci, A. (2014) Linear location-inventory models for service parts logistics network design. *Computers & Industrial Engineering* 69, 1, 53-63.

Hall, D. J. & Saias, M. A. (1980) Strategy follows structure. *Strategic Management Journal* 1, 2, 149–163.

Harland, C. (2002) Purchasing strategy processn In: Day, M. (eds.) Gover handbook of purchasing management. 3rd ed. Aldershot, Gower Publishing Limited.

Hayes, F. A. & Renard, G. A. (1962) Evaluating purchasing performance. New York, American Management Association.

Hendrick, T. E. & Ruch, A. W. (1988) Determining performance appraisal criteria for buyers. *Journal of Purchasing and Materials Management* 24, 2, 18-26.

Heskett, J. L., Sasser, W. E. & Schlesinger, L. A. (1997) The service profit chain. New York, Free Press.

Hirsjärvi, S., Remes, P. & Sajavaara, P. (2009) Tutki ja kirjoita. 15th ed. Helsinki, Tammi.

Hsu, C. C., Kannan, V. R., Keong Leong, G. & Tan, K. C. (2006) Supplier selection construct: instrument development and validation. *The International Journal of Logistics Management* 17, 2, 213-239.

Hudson, M., Smart, A. & Bourne, M. (2001) Theory and practice in SME performance measurement systems. *International Journal of Operations and Production Management* 21, 8, 1096–1115.

Ishaq Bhatti, M., Awan, H. & Razaq, Z. (2014) The key performance indicators (KPIs) and their impact on overall organizational performance. *Quality & Quantity* 48, 6, 3127-3143.

Ittner, C. D. & Larcker, D. F. (1998) Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research* 36, 1–35.

Ittner, C. D., Larcker, D. F. & Randall, T. (2003) Performance Implications of Strategic Performance Measurement in Financial Services Firms. *Accounting, organizations and society* 28, 7, 715–741.

Homburg, C. & Grabe, B. (1999) Towards an improved understanding of industrial services: quality dimensions and their impact on buyer–seller relationships. *Journal of Business-to-Business Marketing* 6, 2, 39–71.

Ivens, B. S. (2005) Flexibility in industrial service relationships: The construct, antecedents, and performance outcomes. *Industrial Marketing Management* 34, 6, 566–576.

Jackson, R. W. & Cooper, P. D. (1988) Unique aspects of marketing industrial services. *Industrial Marketing Management* 17, 2, 111–118

Johansson, P. (2006) Adapting manufacturing strategy to industrial after-sales service operations. Doctoral dissertation. Linköping, Linköping University, Linköping Institute of Technology, Department of Production Economics, No. 101.

Johne, A. & Storey, C. (1998) New service development: a review of the literature and annotated bibliography. *European Journal of Marketing* 32, 3/4, 184-251.

Johnsen, T., Howard, M. & Miemczyk, J. (2014) Purchasing and supply chain management: A sustainability perspective. New York, Routledge.

Kaplan, R. S. & Norton, D. P. (1992) The balanced scorecard - Measures that drive performance. *Harvard Business Review* 70, 1, 71–79.

Kaplan, R. S. & Norton, D. P. (1996) Using the balanced scorecard as a strategic management system. *Harvard Business Review* 74, 1, 75–85.

Karandikar, H. & Vollmar, G. (2006) In-depth observations of industrial service operations. International Conference on Service Systems and Service Management (ICSSSM 2006), October 25-27, Troyes, France.

Kim, J-I. & Shunk, D. L. (2004) Matching indirect procurement process with different B2B e-Procurement systems. *Computers in industry* 53, 2, 153–164.

Kowalkowski, C. (2006) Enhancing the industrial service offering: New requirements on contentand processes. Doctoral Dissertation. Linköping, Linköping University, Institute of Technology, Department of Management and Economics, No. 104.

Lardenoije, E., van Raaij, E. & van Weele, A. (2005) Performance management models and purchasing: Relevance still lost. Proceedings of the 14th IPSERA Conference, March 20-23, Archamps, France.

Lawson, B., Cousins, P. D., Handfield, R. B. & Petersen, K. L. (2009) Strategic purchasing, supply management practices and buyer performance improvement: An empirical study of

UK manufacturing organisations. *International Journal of Production Research* 47, 10, 2649–2667.

Lay, G., Copani, G., Jäger, A. & Biege, S. (2010) The relevance of service in eSuropean Manufacturing Industries. *Journal of Service Management* 21, 5, 715–726.

Lebas, M. J. (1995) Performance measurement and performance management. *International Journal of Production Economics* 41, 1, 23-35.

Lee, D. M. & Drake, P. R. (2010) A portfolio model for component purchasing strategy and the case study of two South Korean elevator manufacturers. *International Journal of Production Research* 48, 22, 1.

Lele, M. M. (1997) After-sales service – necessary evil or strategic opportunity? *Managing Service Quality* 7, 3, 141-145.

Levitt, T. (1983) After the sale is over… *Harvard Business Review* 61, 5, 87-93.

Lindgreen, A., Vanhamme, J., van Raaij, E. M. & Johnston, W. (2013) Go configure: The mix of purchasing practices to choose for your supply base. *California Management Review* 55, 2, 72–96.

Lintukangas, K., Peltola, S. & Virolainen, V-M. (2009) Some issues of supply management integration. *Journal of Purchasing and Supply Management* 15, 4, 240–248.

Lohman, C., Fortuin, L., & Wouters, M. (2004) Designing a performance measurement system: A case study. *European Journal of Operational Research* 156, 2, 267-286.

Marchand, M. & Raymond, L. (2008) Researching performance measurement systems: an information systems perspective. *International Journal of Operations & Production Management* 28, 7, 663–686.

Martinsuo, M., Nenonen, S. & Vaittinen, E. (2020) Teollisen palveluliiketoiminnan perusteet. Tampere University.

Mathe, H. & Shapiro, R. D. (1993) Integrating service strategy in the manufacturing company. London, Chapman & Hall.

Mathieu, V. (1999) Product services portfolio: Strategic and marketing insights. In: McLoughlin, D. & Horan C. (eds.) Interactions, relationships and networks: Towards the new millennium. 15th Annual IMP Conference, September 2–4, Dublin, Ireland.

Mazzucato, M. (2002) Strategy for business: A reader. London, Sage Publications.

McCunn, P. (1998) The eleventh commandment. *Management Accounting (London)* 76, 11 34–36.

Meier, H., Roy, R. & Seliger, G. (2010) Industrial product-service systems - IPS2. *CIRP Annals- Manufacturing Technology* 59, 2, 607–627.

Mentzer, J. T. & Konrad, B. P. (1991) An efficiency/effectiveness approach to logistics performance analysis. *Journal of Business Logistics* 12, 1, 33–62.

Monczka, R., Carter, P. & Hoagland, J. (1979) Purchasing performance: Measurement and control. Michigan State University Business Studies.

Monczka, R. M., Trent, R. & Handfield, R. B. (2002) Purchasing & supply chain management, 2nd ed. Cincinnati, South-Western.

Monczka, R., Handfield, R., Giunipero, L. & Patterson, J. (2009) Purchasing and supply chain management. 4th ed. Cincinnati, South-Western.

Morris, M. (2013) Forecasting challenges of the spare parts industry. *The Journal of Business Forecasting* 32, 3, 22 & 26-27.

Morris, M. H. & Fuller, D. A. (1989) Pricing an industrial service. *Industrial Marketing Management* 18, 2, 139–146.

Moullin, M. (2002) Delivering excellence in health and social care. Buckingham, Open University Press

Moullin, M. (2007) Performance measurement definitions: Linking performance measurement and organisational excellence. *International Journal of Health Care Quality Assurance* 20, 2-3, 181–183.

Nair, A., Jayaram, J. & Das, A. (2015) Strategic purchasing participation, supplier selection, supplier evaluation and purchasing performance. *International Journal of Production Research* 53, 20, 6263-6278.

Najmi, M., Rigas, J. & Fan, I.-S. (2005) A framework to review performance measurement systems. *Business Process Management Journal* 11, 2, 109-122.

Narasimhan, R. & Das, A. (2001) The impact of purchasing integration and practices on manufacturing performance. Journal of Operations Management 19, 5, 593–609.

Neely, A. (1999) The performance measurement revolution: why now and what next? *International journal of operations & production management* 19, 2, 205-228.

Neely, A. (2004) In: Powell, S. (ed.) The challenges of performance measurement. management decision 42, 8, 1017–1023.

Neely, A., Gregory, M. & Platts, K. (1995) Performance measurement system design: a literature review and research agenda. *International Journal of Operations & Production Management* 15, 4, 80-116.

Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. & Kennerley, M. (2000) Performance measurement system design: developing and testing a process-based

approach. *International Journal of Operations & Production Management* 20, 10, 1119-1145.

Nordin, F. (2005) Searching for the optimum product service distribution channel: Examining the actions of five industrial Firms. *International Journal of Physical Distribution and Logistics Management* 35, 8, 576–594.

Novack, R. & Simco, S. (1991) The industrial procurement process: a supply chain Perspective. *Journal of Business Logistics* 12, 1, 145-167.

Nudurupati, S. S., Bititci, U. S., Kumar, V. & Chan, F. T. (2011) State of the art literature review on performance measurement. *Computers & Industrial Engineering* 60, 2, 279-290.

Parikh, M. A. & Joshi, K. (2005) Purchasing process transformation: restructuring for small purchases. *International Journal of Operations and Production Management* 25, 11, 1042–1061.

Ojanen, V., Ahonen, T. & Reunanen M. (2011) Availability and sustainability as value elements in assessing customer value of an industrial service. In: Kocaoglu, D. F., Daim, T. U. & Anderson, T. R. (eds.) Proceedings of PICMET ’11: Technology Management in the Energy Smart World, July 31 – August 4, Portland, USA.

Oliva, R. & Kallenberg, R. (2003) Managing the transition from products to services. *International Journal of Service Industry Management* 14, 2, 160–172.

Parker, C. (2000) Performance measurement. *Work Study* 49, 2, 63–66.

Parmenter, D. (2015) Key performance indicators: Developing, implementing, and using winning KPIs. 3rd ed. Hoboken, New Jersey, Wiley.

Pohl, M. & Förstl, K. (2011) Achieving purchasing competence through purchasing performance measurement system Design—A Multiple-Case Study Analysis. *Journal of Purchasing and Supply Management* 17, 4, 231–245.

Paloheimo, K.-S., Miettinen, I. & Brax, S. (2004) Customer oriented industrial services. Helsinki University of Technology, BIT Research Centre. Espoo, Finland

Porter, M. E. (1985) Competitive advantage: creating and sustaining superior performance. New York, Free Press.

Porter, M. E. (1996) What is strategy? *Harvard Business Review* 74, 6, 61–78.

Prahalad, C. K. & Hamel, G. (1990) The core competence of the corporation. *Harvard Business Review* 68, 3, 79-83.

Quinn, J. B. (1992) Intelligent enterprise. New York, Free Press.

Quinn, F. (2005) The power of procurement. *Supply Chain Management Review* 9, 9, 6–8.

Quinn, J. B. & Hilmer, F. G. (1994) Strategic outsourcing. *Sloan Management Review* 35, 4, 43-55.

Reen N. (2014) The pricing of industrial services. Doctoral Dissertation. Turku, Åbo Akademi University, Åbo Academi University Press.

Regan, W. J. (1963) The service revolution. *Journal of Marketing* 27, 3, 57–62.

Roubtsova, E. & Michell, V. (2013) KPIs and their properties defined with the extreme method. In: Shishkov, B. (ed.) Business modeling and software design. Cham, Springer International Publishing.

Saccani N., Johansson P. & Perona M. (2007) configuring the after-sales service supply chain: A multiple case study. *International Journal of Production Economics* 110, 52- 69.

Sarkis, J. & Talluri, S. (2002) A model for strategic supplier selection. T*he Journal of Supply Chain Management* 38, 1, 18–28.

Saunders, M., Lewis, P. & Thornhill, A. (2016) Research methods for business students. 7th ed. Harlow, Pearson Education.

Schoenherr, T., Modi, S. B., Benton, W. C., Carter, C. R., Choi, T. Y., Larson, P. D., Leenders, M. R., Mabert, V. A., Narasimhan, R. & Wagner, S. M. (2014) Research opportunities in purchasing and supply management. *International Journal of Production Research* 50, 16, 4556-4579.

Shokrani, A., Loukaides, E. G., Elias, E. & Lunt, A. J. G. (2020) Exploration of alternative supply chains and distributed manufacturing in response to COVID-19; a case study of medical face shields. *Materials and Design* 192.

Silverman, D. (2005) Doing qualitative research: A practical handbook. 2nd ed. London, Sage.

Simons, R. (2000) Performance measurement & control systems for implementing strategy. New Jersey, Prentice-Hall, Inc.

Stake, R. E. (2005) Qualitative case studies. in: Denzin, N. K. & Lincoln, Y. S. (eds.) The sage handbook of qualitative research. 3rd ed. Thousand Oaks, Sage Publications.

Suwingnjo, P., Bititci, U. S., & Carrie, A. S. (1997). Quantitative models for performance measurement system: An analytical hierarchy process approach, managing enterprises – Stakeholders, engineering, logistics, and achievement. Mechanical Engineering Publications Ltd. 237–243.

Trent, R. J. & Monczka R. M. (1998) Purchasing and supply management. *International Journal of Purchasing and Material Management* 34, 4, 2-11.

Treleven, M. & Bergman Schweikhart, S. (1988) A risk/benefit analysis of sourcing strategies: single vs. multiple sourcing. *Journal of Operations Management* 7, 4, 93-114.

Van Raaij, E.M. (2016) Purchasing Value: Purchasing and supply management's contribution to health service performance. Rotterdam, Erasmus Research Institute of Management.

Van Weele, A. J. (1984) Purchasing control: Performance measurement and evaluation of industrial purchasing function. Groningen, Wolters Noordhof.

Van Weele, A. J. (2010) Purchasing and supply chain management: Analysis, strategy, planning and practice. 5th ed. Andover, Cengage Learning,

Van Weele, A. J. (2018) Purchasing and supply chain management: Analysis, strategy, planning and practice. 7th ed. Andover, Cengage Learning,

Visnjic Kastalli, I. & Van Looy, B. (2013) Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management* 31, 4, 169–180.

Wagner, S. M., Jönke, R. & Eisingerich, A. B. (2012) A strategic framework for spare parts logistics. *California Management Review* 54, 4, 69–92.

Wise, R. & Baumgartner, P. (1999) Go downstream—The new profit imperative in manufacturing. *Harvard Business Review* 77, 5, 133–141.

Yeung, A. (2008) Strategic supply management, quality initiatives, and organizational performance. *Journal of Operations Management* 26, 4, 490–502.

Yin, R. K. (2003) Case study research: Design and methods. 3rd ed. Thousand Oaks, Sage.

Yu, H., Zeng, A. Z. & Zhao, L. (2009) Single or dual sourcing: Decision-making in the presence of supply chain disruption risks. *Omega* 37, 4, 788–800.

Zeithaml, V., Parasuraman, A. & Berry, L. L. (1985) Problems and strategies in services marketing. *Journal of Marketing* 49, 33-46.

Zsidisin, G. A., Melnyk, S. A & Ragatz, G. L. (2005) An institutional theory perspective of business continuity planning for purchasing and supply management. *International Journal of Production Research* 43, 16, 3401–3420.

APPENDICES

Appendix 1.

General questions:

1. Your role/position and the most important responsibilities?
2. How long have you worked with the procurement? How about for this company?

Questions related to the industrial after-sale service business:

1. Could you describe the industrial after sales services of the company?
2. What are the short-term and long-term goals of the business?
3. What kind of challenges does the business model pose?
4. Could you describe the other challenges and characteristics of the business environment?

Questions related to the procurement and products/items:

1. How would you describe the characteristics of items?
2. Does the company have its own production? What is the share between in-house production and externally purchased items? Does the procurement obtain products to be sold as such or items that are further utilized in manufacturing?
3. How much does the purchased products/items cost?
4. Could you describe the lead-time, quality requirements, and other criteria of the items in general?

Questions related to the procurement and organization:

1. How would you describe the procurement organization? Is it centralized or decentralized?
2. What is the size of the procurement organization?
3. What are the main responsibilities of the operative, tactical, and strategic departments?

4. What are the main goals of the operative, tactical, and strategic departments?
5. Does the environment create any challenges to the procurement?
6. How do you get the information of the products to be purchased?
7. How is the cooperation with the sales like?

Questions related to the supplier relationship management:
1. How would you describe the company's processes related to the supplier relationship management?
2. What goals does the company have related to the supplier relationship management? Are partnership-style collaboration models utilized?
3. How many active suppliers there are in the industrial after sales service business?
4. How global are the suppliers?
5. Is the supplier performance aimed to be improved?
6. How is the supplier performance measured?
7. What are the challenges related to the supplier relationship management?

Questions related to the procurement, measuring and metrics:
1. What kind of procurement metrics are used?
2. How, and for what purpose, is the procurement performance measured?
3. How would you describe the level of procurement measurement at the moment?
4. What are the challenges related to measuring and/or metrics?
5. What are the key success factors of the procurement?

Appendix 2.

General questions:
1. Your role/position and the most important responsibilities?
2. How long have you worked in similar positions? How about for this company?

Questions related to the industrial after-sales service business:
1. Could you describe the industrial after-sales services of the company?
2. What are the short-term and long-term goals of the business?
3. What kind of challenges does the business model pose?

4. Could you describe the other challenges and characteristics of the business environment?

Questions related to the customers:

1. How global are the operations?
2. Could you describe the criteria and other requirements that the customers have?
3. What are the key success factors in customer relationship management?
4. What are the main challenges of customer relationship management?

Questions related to supply chain:

1. How are the products/items stored before delivery? Are safety stocks or direct deliveries from supplier to the customer utilized?
2. Could you describe the challenges related to the supply chain?
3. How is the supply chain performance measured?
4. What is the role of procurement in the supply chain like?
5. How is the cooperation with the procurement like