Savings Measurement for Capital Equipment Purchasing: Procedures, Challenges, Contingencies, and Behavioral Aspects

D I S S E R T A T I O N
of the University of St. Gallen,
School of Management,
Economics, Law, Social Sciences
and International Affairs
to obtain the title of
Doctor of Philosophy in Management

submitted by

Daniel Maucher

from

Germany

Approved on the application of

Prof. Dr. Wolfgang Stölzle

and

Prof. Dr. Ralf Elbert

Dissertation no. 4163

KDD Kompetenzzentrum Digital-Druck GmbH, Nürnberg 2013

The University of St. Gallen, School of Management, Economics, Law, Social Sciences and International Affairs hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.

St. Gallen, May 17, 2013

The President:

Prof. Dr. Thomas Bieger

Vorwort

Die vorliegende Dissertation ist das Ergebnis meiner Forschungstätigkeit am Lehrstuhl für Logistikmanagement der Universität St.Gallen (LOG-HSG). Die Motivation zur Untersuchung des Themas „Savings Measurement for Capital Equipment Purchasing“ entstand im Rahmen meiner Arbeit am „Kerkhoff Competence Center of Supply Chain Management”, einer Kooperation des LOG-HSG mit der auf Einkauf und Supply Chain Management spezialisierten Unternehmensberatung Kerkhoff Consulting. Die praktischen Herausforderungen der Unternehmen, Savings beim Investitionsgütereinkauf zu ermitteln und darzustellen, haben mich dazu veranlasst, dieses Thema wissenschaftlich zu untersuchen.

Dieses Vorwort möchte ich nutzen, um all denen zu danken, die mich während meiner Dissertationszeit unterstützt haben.

An erster Stelle möchte ich Herrn Prof. Dr. Wolfgang Stölzle (LOG-HSG) für die intensive fachliche und persönliche Betreuung der Dissertation sowie die Begleitung meiner Praxisprojekte danken. Ebenso gilt mein Dank Herrn Prof. Dr. Ralf Elbert (Technische Universität Darmstadt) für die Übernahme des Koreferats. Einen grossen Dank möchte ich auch an Herrn Prof. Dr. Erik Hofmann (LOG-HSG) richten. Durch die Einbringung seiner Ideen und der Erfahrung in der Veröffentlichung von Journal-Beiträgen sowie dem konstruktiven fachlichen Austausch hat er massgeblich zum Erfolg der Dissertation beigetragen. Des Weiteren möchte ich Herrn Associate Professor Sof Thrane von der Copenhagen Business School für die anregenden Diskussionen, seine Mitarbeit sowie die Gastfreundschaft während meines Forschungsaufenthalts in Kopenhagen danken.

Diese Arbeit wäre nicht möglich gewesen, ohne die Bereitschaft zahlreicher Unternehmensvertreter, sich für Interviews zur Verfügung zu stellen. Für ihre kostbare Zeit und die interessanten Gespräche möchte ich mich daher sehr herzlich bedanken. Weiterhin gilt mein Dank Herrn Michael Seebauer vom „Laboratory for Experimental Research Nuremberg“ an der Friedrich-Alexander-Universität Erlangen Nürnberg für die tatkräftige Unterstützung bei der Organisation zur Durchführung der Experimente.

Einen besonderen Dank möchte ich an meine Kollegen vom LOG-HSG aussprechen, die mich durch zahlreiche Diskussionen und Anregung fachlich bei der Dissertation unterstützt haben, mit denen ich aber auch viele schöne private Momente erleben

durfte. Besonders hervorheben möchte ich dabei meine Kollegen und Freunde Patrick Beck, Sebastian Freund, Konstantin Gebert, Jörg Grimm und Kerstin Lampe.

Mein grösster Dank gilt schliesslich meinen Eltern Mira und Georg Maucher, die mich stets in allen Belangen unterstützt und mir den nötigen Rückhalt für das Gelingen dieser Arbeit gegeben haben.

St. Gallen, im Juli 2013 Daniel Maucher

Table of contents

List of figures

Appendix A

Appendix C

List of tables

Appendix A

Appendix B

Appendix C

List of abbreviations

ABC	Activity based costing
BCM	Budget comparison method
BsC	Behavior-specific challenge
CEP	Capital equipment purchasing
CPO	Chief procurement officer
IP	Initial proposition
KPI	Key performance indicator
MCS	Management control systems
NPV	Net present value
P-BSC	Purchasing balanced scorecard
PQM-SIO	Price quotation method – single initial offer
PsC	Procedure-specific challenge
PVA	Procurement value added
RQ	Research question
TCO	Total cost of ownership

Summary

Savings measurement deals with the capture, calculation and display of the monetary performance of the purchasing process. In most companies, savings are the predominant performance measure in procurement. Capital equipment purchasing (CEP) affects about 15% of total purchasing spend and is therefore a significant topic in corporate practice. However, savings measurement for CEP faces special challenges, such as missing reference prices, the importance of related lifecycle costs and manipulation of the results. Despite its practical relevance, savings measurement for CEP has not been discussed in academic literature so far.

The theoretical background of the dissertation is provided through a review of the related literature in the relevant research fields. Furthermore, principal-agent theory, motivation theories and contingency theory are discussed with reference to savings measurement for CEP.

The research methodology is structured into three research phases. First, a descriptive case study as well as a literature review are carried out to give a general overview of the research field and to allow conceptual considerations. In the second research phase, qualitative interviews with 18 companies are conducted to examine contingent factors in savings measurement for CEP. In research phase 3, two laboratory experiments with 114 participants each are run to test behavior-specific aspects of savings measurement for CEP.

The results show, amongst others, that procedure-specific and behavior-specific challenges in savings measurement for CEP can be distinguished. Furthermore, the findings reveal that contingent factors of general management control systems play an important role for the case of savings measurement for CEP and that different savings calculation methods lead to different outcomes in CEP. Finally, managerial implications concerning procedure- as well as behavior-specific aspects and contingency-based design of savings measurement for CEP, the evaluation of CEP projects and CEP negotiations are presented.

Zusammenfassung

Die Savings-Messung beschäftigt sich mit der Erfassung, Berechnung und Darstellung des monetären Erfolges des Einkaufsprozesses. In den meisten Unternehmen sind Savings die vorherrschende Erfolgskenngrösse im Einkauf. Der Investitionsgütereinkauf (IGE) beeinflusst etwa 15% des gesamten Einkaufsvolumens und ist daher für viele Unternehmen von grosser Bedeutung. Im Rahmen der Savings-Messung beim IGE ergeben sich allerdings besondere Herausforderungen, wie z.B. fehlende Referenzpreise, die Bedeutung der Lebenszykluskosten und die Manipulation der Ergebnisse. Trotz der praktischen Relevanz wurde die Savings-Messung beim IGE in der akademischen Literatur bislang nicht diskutiert.

Eine Literaturrecherche der relevanten Forschungsfelder bildet zunächst die theoretische Grundlage der Arbeit. Des Weiteren werden die Prinzipal-Agent Theorie, Motivationstheorien und die Kontingenztheorie in Bezug auf die Savings-Messung beim IGE diskutiert.

Die Forschungsmethodik ist in drei Forschungsphasen gegliedert. In der ersten Forschungsphase werden eine deskriptive Fallstudie und eine Literaturrecherche durchgeführt, um einen allgemeinen Überblick des Forschungsfeldes zu geben und konzeptionelle Überlegungen zu ermöglichen. In der zweiten Forschungsphase werden zur Untersuchung von Kontingenzfaktoren der Savings-Messung beim IGE qualitative Interviews mit 18 Unternehmen geführt. Um verhaltensspezifische Aspekte der Savings-Messung beim IGE zu testen, erfolgt in der dritten Forschungsphase die Durchführung zweier Laborexperimente mit 114 Teilnehmern.

Die Ergebnisse zeigen unter anderem, dass verfahrens- und verhaltensspezifische Herausforderungen der Savings-Messung beim IGE bestehen. Weiterhin offenbart die Untersuchung die bedeutende Rolle, die Kontingenzfaktoren allgemeiner Managementkontroll-Systeme für den Fall der Savings-Messung beim IGE spielen. Schliesslich verdeutlicht die Analyse den Einfluss der verwendeten Savings-Berechnungsmethode auf die Angebotsauswahl sowie den Verhandlungserfolg beim IGE. Ausserdem werden praktische Handlungsempfehlungen in Bezug auf verfahrens- sowie verhaltensspezifische Aspekte und das kontingenzabhängige Design der Savings-Messung beim IGE, die Beurteilung von IGE-Projekten und IGE-Verhandlungen gegeben.

1. Introduction

First, the managerial relevance of the research topic – savings measurement for capital equipment purchasing (CEP) – is discussed by means of four cases from corporate practice. This is followed by an analysis of the theoretical relevance of the topic. Based on the findings from these sections, the research questions (RQs) are formulated. Finally, the research is positioned within scientific theory and the thesis outline is presented.

1.1. Managerial relevance

Procurement performance measurement is employed by 60% of companies and is still gaining importance in corporate practice (Daxböck et al., 2011). Thereby, costs are the most relevant performance dimension with about 90-95% of organizations applying procurement performance measurement involving savings (CAPS Research, 2011; Quitt, 2010). The main reasons for savings measurement are proof and companies' internal and external communication of procurement performance, usage for budgets and adherence to company rules (Quitt, 2010). However, observable measurement results are also to a certain extent uncertain (Quitt, 2010).

Savings measurement can involve different commodity groups, such as production material, supplies, merchandise, services and capital equipment (cf. Large, 2009). In this context, capital equipment poses a special challenge to savings measurement, for example because of the erratic purchasing cycles. Furthermore, CEP accounts for a significant part of total purchase spend. In many companies, spend for CEP averages about 8-11% of total purchase spend (CAPS Research, 2005; Fearon & Bales, 1995). Furthermore, CEP decisions influence related lifecycle costs (e.g., energy, maintenance, repair and operating supplies), which often add up to about 5% of total purchase spend (Fearon & Bales, 1995), as well as purchasing transaction and production costs. In the following, typical problems and challenges concerning savings measurement for CEP are described by means of four practical cases, conducted through personal interviews and project work.

Case A is a company from the construction industry with about 2,500 employees and sales of about € 580 m. Company A consists of 35 profit centers, total spend amounts

to € 260 m. and expenses for capital equipment are about € 30 m. Despite the size of the company and the understanding of the usefulness of a procurement performance measurement system for CEP, the company is not equipped with such a system. Therefore, company A raises the question of how the monetary performance for CEP can be measured with low administrative effort.

Case B is a construction material manufacturer with about 80,000 employees, € 18 bn. sales, total spend of € 12 bn. and expenses of € 1 bn. for CEP. One major procurement performance measurement instrument in company B is the purchasing balanced scorecard (P-BSC), encompassing 56 performance indicators (e.g., total spend, savings, processes, inventory and supplier performance). A major challenge for company B in savings measurement for CEP is the reference price definition. Due to the fact that no market price for capital equipment is normally available, the calculated savings for CEP cannot be compared with other commodity groups. Therefore, capital equipment is the only commodity group excluded from the aggregated savings calculation in this company. This raises the question, how comparable and bottom line effective savings for CEP can be calculated.

Case C is a consulting company specializing in purchasing and procurement with about 100 employees and € 16 m. in sales. The topic of CEP is becoming a more important consulting product, because in many companies the degree of professionalism in this area has not yet reached the required level. Savings measurement is a major challenge for company C in the area of CEP. Customers expect a variable remuneration of the consulting company depending on realized savings. Missing reference prices and different circumstances in every project require easily understandable and reliable calculation methods. The main question for company C is therefore, which methods should be used to calculate savings in different CEP situations.

Case D is a large manufacturer from the chemical industry with more than € 20 bn. total spend and € 1.7 bn. spend for capital equipment. The main challenges for company D concern behavior-specific aspects in savings measurement for CEP, for example, purchasers trying to manipulate the savings calculation in order to receive higher bonuses. Another problem is that superiors sometimes conduct the control, even though their bonuses also depend on the results of the savings measurement. This leads to the problem of management's distrust of the savings measurement's results.

Therefore, an important question for company D is how the savings calculation method that is used influences behavior in CEP.

Another question relevant to all of the analyzed cases is how savings measurement for CEP has to be designed in order to obtain high CEP performance. Thereby, the situation of an organization (e.g., industry) and its characteristics (e.g., size, structure) have to be considered.

Based on the presented cases the following practical need for action concerning savings measurement for CEP can be derived:

1. Improvement suggestions for the development of appropriate savings calculation methods for CEP need to be given.
2. Recommendations for the situation-specific selection of savings calculation methods for CEP need to be made.
3. The influence of savings measurement on the behavior of the involved persons in CEP needs to be analyzed.
4. Company-specific recommendations for the design of savings measurement for CEP have to be developed.

1.2. Theoretical relevance

1.2.1. Relevant research fields

The research topic – savings measurement for CEP – is mainly influenced by four research fields: procurement control and procurement performance measurement, behavioral management accounting, organizational buying behavior and procurement organization (Figure 1). Other related research fields with a broader focus that influence the research topic, are for example, performance management, behavioral economics and management of organizations. In the following, an overview of the topics within the most relevant research fields concerning savings measurement for CEP is given.

Procurement control and procurement performance measurement

Savings measurement for CEP can be classified as a special research topic within procurement control and procurement performance measurement. Therefore, these research fields are especially important in examining the research topic. Relevant

academic publications on procurement control can be found in books (e.g., Buck, 1998; Friedl, 1990; Gleich et al., 2010; Piontek, 2004; Reinschmidt, 1989; Wagner & Weber, 2006; Weele, 1984), book sections (e.g., Arnold & Warzog, 2006; Baumgarten & Darkow, 2003; Dobler et al., 1990; Eßig, 2007; Kaufmann et al., 2005) and journal articles (e.g., Arnold et al., 2005; Axelsson et al., 2002; Jahns, 2004; Joyce, 2006; Kümpel & Deux, 2003; Stölzle, 2007). Although procurement performance measurement is just one element of procurement control (Arnold & Warzog, 2006), it has an important position in the academic literature. Literature concerning procurement performance measurement can be grouped as follows: literature on procurement performance measurement in general (e.g., Beidelman, 1987; Dumond, 1994), literature with a special performance focus, methods and instruments in procurement performance measurement, performance ratios (e.g., Chao et al., 1993; Hendrick & Ruch, 1988; Hult, 1997; Krause et al., 2001) and literature on determinants of procurement performance (e.g., Cai et al., 2006; Hemsworth et al., 2005; Noordewier et al., 1990). The literature with a special procurement performance focus analyzes, for example, procurement competence (e.g., Das & Narasimhan, 2000; Narasimhan et al., 2001), the internal service performance of procurement (e.g., Fredendall et al., 2005; Stanley & Wisner, 1998; Young & Varble, 1997) or other performance topics (e.g., Cavinato, 1987; Dumond, 1994; Yuthas & Young, 1998). Examples of methods and instruments for procurement performance measurement discussed in the literature include the following: savings measurement (e.g., Emiliani et al., 2005; Johnson & Leenders, 2010; Nollet et al., 2008), benchmarking (e.g., Carr & Smeltzer, 1999; Sánchez-Rodríguez et al., 2003), data envelopment analysis (e.g., Easton et al., 2002; Murphy et al., 1996; Saranga & Moser, 2010), procurement performance measurement systems (e.g., Kumar et al., 2005; Pohl & Förstl, 2011) and P-BSC (e.g., Wagner & Kaufmann, 2004).

Behavioral management accounting

Behavioral aspects play an important role in savings measurement for CEP. Therefore, the literature on behavioral management accounting needs to be considered in the analysis. Behavioral management accounting is a multidisciplinary branch of economics, where economical, psychological and sociological perspectives have merged (Süßmair, 2000). The term behavioral management accounting first appeared in the literature in the late 1960s (Becker, 1967). According to Bruns and Coster

(1969), "behavioral accounting considers the impact of the processes of measuring and reporting on people and organizations, which is an addition to the technical problems of carrying out those processes which are traditionally the focus of accounting" (p. 3). Behavioral management accounting research can be divided into literature on accounting information systems, auditing, financial accounting, managerial accounting and taxation (Bamber, 1993). Meyer and Rigsby (2001) classify articles on behavioral management accounting research into literature on managerial control, accounting information processing, accounting information system design, auditing process research and organizational sociology, historical / categorical / future research, behavioral management accounting research design, career paths of accountants, ethics and other. The major topics within behavioral management accounting are judgment and decision making by managers (e.g., configuration of key performance indicators (KPIs), control and incentive systems), incentives and control (e.g., incentive effects of objectives, coordination and KPI systems) as well as management control systems (MCS) (e.g., relations between specific contingencies and MCS and their performance) (Gillenkirch & Arnold, 2008).

Organizational buying behavior

A third relevant literature stream for CEP savings measurement is literature on organizational buying behavior. "Organizational buying behavior includes all activities of organizational members as they define a buying situation and identify, evaluate, and choose among alternative brands and suppliers" (Webster & Wind, 1972, p. 14). Research on organizational buying behavior began in the late 1960s (Johnston & Lewin, 1996) and increased significantly in the early 1980s (Ward & Webster, 1991). Sheth (1996) identified four major research streams in the organizational buying behavior literature:

- Conceptual models in organizational buying behavior: Early publications in this field that predominately influenced later research are, for example, Robinson and Faris (1967), Sheth (1973) and Webster and Wind (1972). Understanding the decision-making process from the marketing perspective plays an important part in this research field (Sheth, 1996). Research topics in this context include, for example, the organizational buying process (e.g., Anderson & Chambers, 1985; Banting et al., 1991; Nicosia & Wind, 1977), environmental influences (e.g., Grønhaug, 1976), organizational influences (Webster & Wind, 1972) and

interpersonal influences on the individual's decision in organizational buying (e.g., Thomas, 1982).

- Buyer-seller interaction and buyer-seller relationships: A classical work in this research field is for example El-Ansary and Stern's (1972) study, which presented a model for power measurement in relationships. A research theory that influences this research area is, for example, the transaction cost theory.
- Partnering with suppliers: The IMP Group, a research project on "industrial marketing and purchasing", plays an important role in this research area. They developed the interaction model, a dynamic model of buyer-supplier-relationships (Turnbull & Valla, 1989).
- Supply chain partnering and the use of information technology: This topic includes, for example, literature on collaboration between organizations (e.g., Boddy et al., 2000), just-in-time (e.g., Handfield, 1993; Waters-Fuller, 1995) and electronic data interchange in supply chains (e.g., Hill & Scudder, 2002; Webster, 1995).

Procurement organization

Procurement organization is a very wide research topic. In organizational theory, a general distinction can be made between organizational structure and process organization (Laux & Liermann, 2005). The main research streams in the procurement organization literature cover the topics of organizational design, buying center and cross-functional teams, procurement staff (organizational structure) and purchasing process (process organization). In the literature on organizational design types or structures, the following topics are, for example, discussed: centralization and decentralization (e.g., Cavinato, 1992; Johnson & Leenders, 2001; Rozemeijer, 2000; Tchokogué et al., 2011; Trent, 2004), factors that influence an organization's design or cause an organization to change its design (e.g., Carter & Hendrick, 1997; Hartmann et al., 2008b; Kotteaku et al., 1995; Xideas & Moschuris, 1998), effects of types of designs or structures (e.g., Glock & Bogaschewsky, 2009; Luzzini & Ronchi, 2011) and procurement responsibilities (e.g., Ellram & Pearson, 1993; Johnson & Leenders, 2006). The literature on buying center and cross-functional teams covers the following topics: structure of the buying center (e.g., Ghingold & Wilson, 1998; Greenley & Matcham, 1986), factors that influence the buying center (e.g., Dawes et al., 1992; Lewin & Donthu, 2005; McCabe, 1987), team leaders in procurement teams (e.g.,

Trent, 1996), problems in a cross-functional purchasing decision process (e.g., Moses & Åhlström, 2008), factors that influence procurement teams (e.g., Johnson et al., 2002) and factors that influence procurement teams' performance (e.g., Driedonks et al., 2010; Trent & Monczka, 1994). The literature that deals with procurement staff comprises the following: the procurement job (e.g., Giunipero & Vogt, 1997; Hallenbeck Jr et al., 1999; Jackson, 1990), motivating the procurement staff, for example, through incentive systems (e.g., Englyst et al., 2008; Pagell & Das, 1996) and the role of the chief procurement officer (CPO) (e.g., Fraser Johnson et al., 1999; Johnson & Leenders, 2008). The literature on the purchasing process involves the purchasing process in general (e.g., Novack & Simco, 1991), the purchasing process for special purchases, for example, services (e.g., Parikh & Joshi, 2005; van der Valk & Rozemeijer, 2009) and factors that influence the purchasing process (e.g., Jennings & Plank, 1995; Lambros & Socrates, 2001).

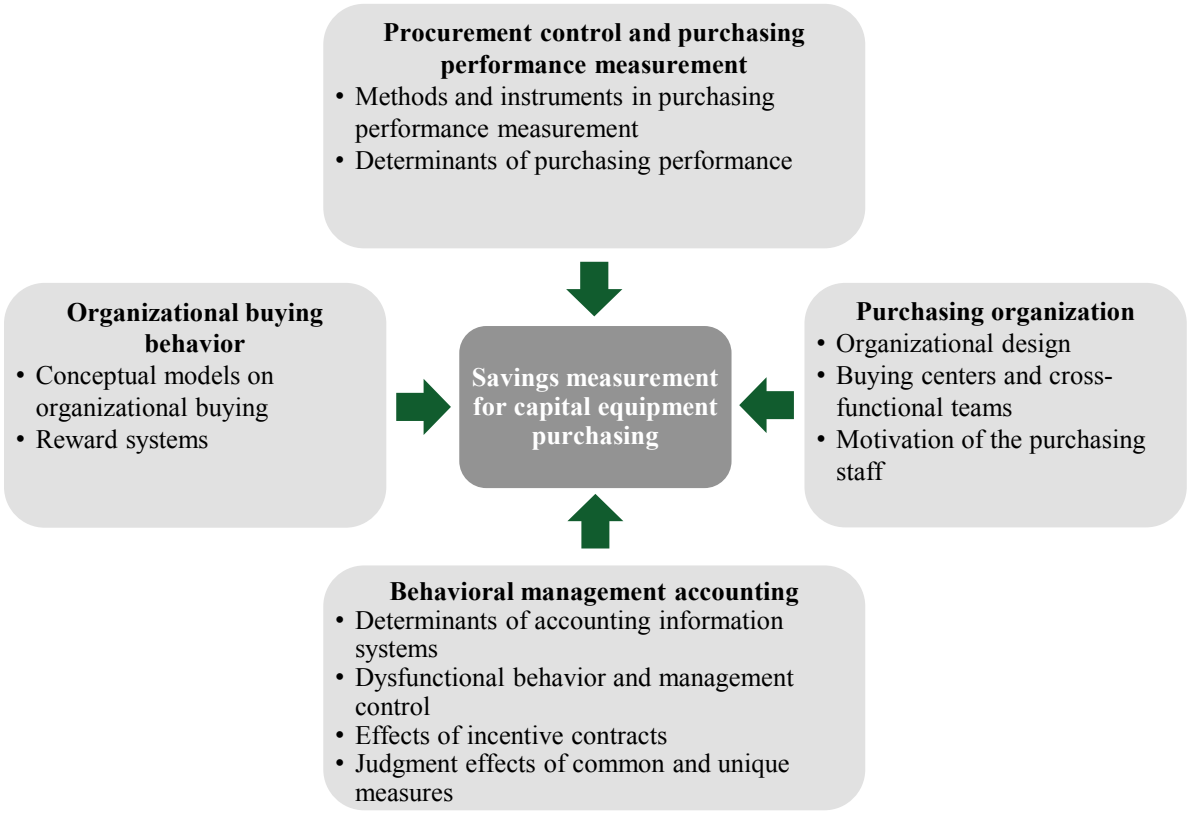

Figure 1: Relevant research fields with sample topics

1.2.2. State of research and research gap

Based on the previous analysis of the topics within the relevant research fields, contributions to savings measurement for CEP and research gaps are now discussed.

Procurement control and procurement performance measurement form the framework to savings measurement for CEP, which is a special method within procurement performance measurement. Procurement performance measurement for CEP has not been analyzed in academic literature so far. However, the research field provides many methods and instruments (e.g., benchmarking, procurement value added (PVA), P-BSC, data envelopment analysis, supplier lifetime value, procurement performance measurement systems) that might also be useful for savings measurement for CEP. Furthermore, organizational topics within the field of procurement control and procurement performance measurement have implications on savings measurement for CEP. Examples are the general procurement performance measurement process and the embedding of incentive systems in procurement control.

The topic of savings measurement is a part of procurement performance measurement. The academic literature on savings measurement is sparse and basically focuses on savings measurement for regularly procured production material. For example, Quitt (2010) develops a process for measuring the budget effects of supply management. Smeltzer and Manship (2003) as well as Johnson and Leenders (2010) introduce challenges and make recommendations for improving savings measurement, while Nollet et al. (2008) analyze the implementation of a cost savings measurement system. Emiliani et al. (2005) elucidate tactics that buyers use to manipulate savings measurement and Entchelmeier (2008) introduces different methods for savings measurement. The listed publications form the basis for the analysis on savings measurement for CEP. With reference to the identified practical need for action, especially the publication by Entchelmeier (2008) can support the development and situation-specific selection of appropriate CEP savings calculation methods. Furthermore, Emiliani et al. (2005) contribute to the influence of savings measurement on the behavior of the involved persons in CEP.

Concerning the literature on behavioral management accounting, the following topics are particularly relevant to this dissertation as they contribute to the discussion on the relation between savings measurement for CEP and employees' behavior: dysfunctional behavior and management control (e.g., Birnberg et al., 1983; Jaworski & Young, 1992; Pfeffer & Sutton, 1999; Steele & Albright, 2004), effects of incentive contracts (Ashton, 1990; Awashti & Pratt, 1990; Bonner & Sprinkle, 2002; Sprinkle, 2000) and judgment effects in performance evaluations (e.g., Lipe & Salterio, 2000;

Lipe & Salterio, 2002; Morssinkhof et al., 2011; Rich, 2007; Slovic & MacPhillamy, 1974). Finally, the literature on determinants of accounting systems (e.g., Chenhall, 2003; Dunk, 1992; Libby & Waterhouse, 1996; Otley, 1980) form the basis for company-specific recommendations for the design of CEP savings measurement.

Organizational buying behavior also encompasses behavioral aspects in CEP, which influence the results of savings measurement. As an example, the purchaser's behavior in CEP negotiations has to be considered in savings measurement design. Furthermore, the rewards system has been identified as a major organizational determinant of buying behavior. Savings measurement often delivers the base data for the rewards system and influences buying behavior. Therefore, the existing conceptual models on organizational buying behavior provide the starting point for developing a model concerning savings measurement for CEP.

Concerning the literature on procurement organization, three subtopics are especially important for the research on savings measurement for CEP. The organizational design has a strong influence on the design of savings measurement for CEP, because performance measurement has to be adapted to the structure and process organization of purchasing. For example, the procurement organization's degree of decentralization, the company size and the procurement department's status are expected to influence savings measurement for CEP. As CEP often takes place under the responsibility of buying centers or cross-functional teams, this literature has to be considered in the research project. Finally, the literature on motivation of the purchasing staff is important in this research topic, because savings measurement for CEP is often linked to incentive systems.

Despite its practical relevance, savings measurement for CEP has not been explicitly analyzed in academic literature so far and is also considered as a topic for future research (Quitt, 2010). The relevant research fields contribute in different ways to the identified practical need for action. However, they do not offer directly applicable solutions and answers to savings measurement for CEP. Possible research gaps with a practical relevance concerning savings measurement for CEP, therefore, involve the development and situation-specific selection of calculation methods, the company-specific design of savings measurement for CEP and behavior-specific aspects.

1.3. Research objectives and research questions

The research objectives are based on the identified research gaps. Therefore, the research project attempts to pursue the following research objectives:

1. In order to be able to make recommendations on the development and situation-specific selection of CEP calculation methods, the research project first intends to analyze savings measurement for CEP in corporate practice. Therefore, the research project endeavors to identify savings calculation procedures, methods in use and practical challenges in savings measurement for CEP.
2. Concerning recommendations on the company-specific design of savings measurement for CEP, the research attempts to analyze relevant contingencies.
3. With reference to behavioral aspects in savings measurement for CEP, the research project will endeavor to identify behavioral challenges and examine selected behavioral aspects, such as supplier selection and negotiations, in savings measurement for CEP.
4. Based on the analysis, the research intends to make recommendations for the situation-dependent design and the behavioral challenges of savings measurement for CEP.

The topic – savings measurement for CEP – is an inherent part of procurement performance measurement and evaluation for CEP, which forms the framework and will also be covered in the analysis. Furthermore, relevant research theories will be determined and the influence of these theories on savings measurement for CEP will be examined.

In order to fill the described research gap and to address the practical challenges, the research project aims to answer the following RQs:

- RQ1: How do companies measure savings for CEP and what are the main challenges?
- RQ2: How do contingent factors influence savings measurement for CEP?
- RQ3: How does the applied savings calculation method influence behavior in CEP?

The research project also attempts to provide managerial implications on how savings measurement for CEP can be improved in corporate practice.

1.4. Positioning of research within scientific theory

In this section, the research project is classified within scientific theory. Scientific theory analyzes the functionality of scientific cognition (Schurz, 2006) and covers objectives, statements and methods of sciences and provides requirements for scientific behavior (Raffée & Abel, 1979). Thereby, general and specific (e.g., physics, biology, economics) scientific theory can be distinguished (Schurz, 2006).

According to Ulrich and Hill (1979), science can be classified into formal and factual sciences. Formal sciences (e.g., logic, mathematics) deal with ideas and factual sciences (e.g., physics, economics) deal with facts (Bunge, 1998). Furthermore, factual sciences can be divided into natural sciences (e.g., physics, biology) and cultural sciences (e.g., sociology, economics).

In economics, human behavior is studied "as a relationship between ends and scarce means which have alternative uses" (Robbins, 2007, p. 15). Business economics, as a branch of economics, deals with "decision processes in private enterprises in a market-based competition"(Wöhe & Döring, 2010, p. 27).[1] Within business economics, different business functions can be distinguished. The main functions are as follows: marketing, purchasing and warehousing, production, research and development, accounting, financing, investment, human resources, organization, leadership, information and knowledge management, law (Thommen & Achleitner, 2012).

The purchasing function is the focus of this dissertation. Concerning this business function, many similar terms and concepts exist (Arnold et al., 2005). However, especially in corporate practice, the terms purchasing, procurement, sourcing, materials management and supply management are often used interchangeably (Leenders et al., 2009). There are different definitions for each term in the academic literature. Therefore, an appropriate distinction shall be given, which will be used in this dissertation. The term purchasing emphasizes above all the operative character of the buying process (Arnold, 1990), such as demand assessment, supplier identification and selection, price negotiation, ensuring delivery (Leenders et al., 2009). Procurement also refers to strategic activities and comprises all activities to make goods and services available from external sources for a company (Arnold, 1997). Supply management can be used interchangeably with procurement and also covers the

[1] Own translation from German.

corresponding planning and control processes (Kaufmann, 2001). In the following, the term procurement will be used for the entirety of the strategic and operative buying activities. The term sourcing mainly focuses on the design of supplier relationship management (Kaufmann, 1995) and materials management is concerned with the movement and storage of goods in the logistics network from suppliers to the customers (Coyle et al., 2010). The acquisition of capital equipment mainly refers to the operative buying process. Therefore, in the following, the term purchasing will be used in conjunction with buying of capital equipment and performance as well as savings measurement for CEP .

The research process of this dissertation follows the "framework of logistics research" (Figure 2) proposed by Mentzer and Kahn (1995), which will be briefly described in the following. The aim of this framework is to ensure managerial relevance and scientific rigor in research. According to Mentzer and Kahn (1995), the first step in this framework is the generation of a research idea. The initial idea to analyze "savings measurement for CEP" arises from project work with a purchasing and procurement consultancy. The project reveals that this topic poses a challenge to many companies and the academic literature does not provide sufficient information. In the next step, a literature review and observations in reality have to be applied to obtain substantive justification. Concerning literature reviews integrative, methodological and theoretical reviews can be distinguished (Mentzer & Kahn, 1995). Integrative literature reviews generate new frameworks and propositions for a specific topic (Torraco, 2005). Methodological literature reviews focus on methodological approaches and theoretical literature reviews result in the formulation of hypotheses to be tested (Mentzer & Kahn, 1995). In the present dissertation, integrative literature reviews and theoretical literature reviews were applied. The observations in different cases provide the basis for the managerial relevance of the research. Once the substantive justification has been established, RQs can subsequently be formulated.

In the next step, relevant theories have to be identified and involved in the research process. A theory in science is defined as a "system of statements (propositions, theorems, hypotheses, axioms, assumptions) on objects in a specific research area" (Eichhorn, 1979, p. 80).[2] Based on theories, hypotheses on the research topic have to

[2] Own translation from German.

be formulated and constructs have to be developed. A hypothesis is a statement that objectively has a truth value (testable if true or wrong) and subjectively has a truth claim (Chmielewicz, 1979). A construct is a term generally designed "to organize knowledge and direct research in an attempt to describe or explain some aspect of nature" (Peter, 1981, p. 134). Constructs are interpreted against the backdrop of the theory in which they are applied and have to be operationalizable, that is they can actually be measured (Mentzer & Kahn, 1995). For this purpose, suitable measures have to be designed. Appropriate research methodologies have to be selected based on the RQs, theories, hypotheses and constructs. The main methodologies applied in this dissertation are literature review, case study research and experimental research. In order to attain the acceptability of the research results, validity, reliability and precision have to be ensured in the application of the research methodologies (Mentzer & Kahn, 1995). Finally, the gathered data have to be analyzed and conclusions have to be drawn. In this framework, RQ1 is primarily answered in the steps from idea generation to substantive justification. RQ2 and RQ3 build on that and are analyzed in the remaining process steps.

The research combines qualitative as well as quantitative research and mainly follows descriptive and exploratory (RQ1) as well as deductive approaches (RQ2 and RQ3). In deductive reasoning, established theories are tested for specific instances, such as savings measurement for CEP (Hyde, 2000).

1.5. Thesis outline

In this section, the outline of the thesis will be described. Chapter 1 provides an introduction to the dissertation. First, the managerial relevance of the research topic is presented through a description of the importance of the topic. Furthermore, four cases are presented to show the relevance and challenges of savings measurement for CEP in corporate practice.

In Chapter 2, the theoretical background to the dissertation is given. First, the relevant research topics are presented. Hence, the main characteristics of capital equipment and CEP are discussed. Subsequently, a funnel-shaped introduction to the research topic – savings measurement for CEP – is provided. Beginning with procurement control in general, procurement performance measurement and evaluation are outlined in the next step. Finally, savings measurement, as monetary procurement performance

measurement, is discussed in general and for the case of CEP. In the second part of this chapter, an assortment of relevant research theories for the research topic (principal-agent theory, motivation theories and contingency theory) is presented.

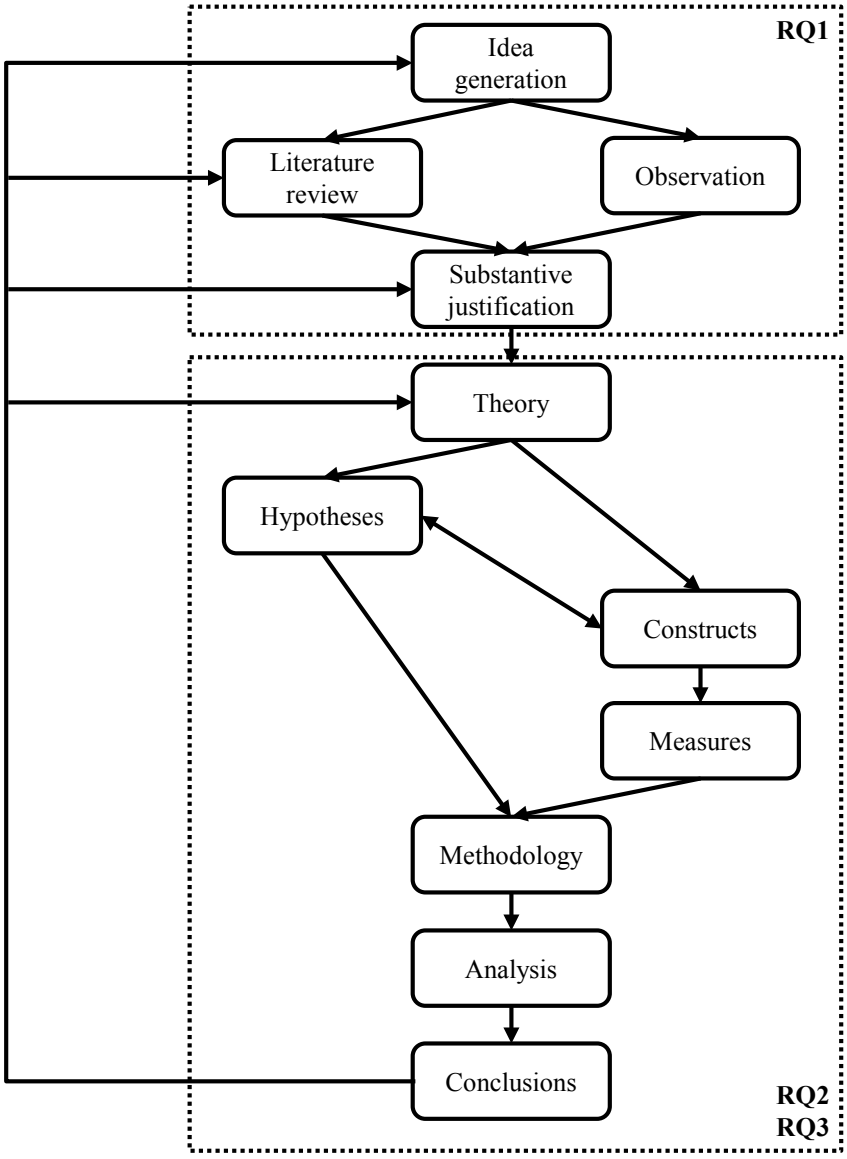

Figure 2: Framework of logistics research (cf. Mentzer & Kahn, 1995)

Chapter 3 provides an overview of the research framework and the applied research methodologies. The research framework shows the areas of analyses, supposed relationships, a placement of the RQs and the relevant research theories. Furthermore, the applied research methods (literature review, case studies and a laboratory experiment) are discussed concerning their appropriateness for the RQs and the design that was utilized.

In Chapter 4, the key research findings from the three research phases and the related papers are presented. In Paper A, challenges in savings measurement for CEP as well as a preliminary conceptual CEP savings measurement model are presented. In Paper B, case study research is used to analyze how characteristics and challenges of performance and savings measurement for CEP influence contingency-based relationships in this research area compared to general MCS. Paper C investigates behavioral aspects in savings measurement and negotiations for CEP and evaluates CEP projects with two laboratory experiments.

Finally, in chapter 5, theoretical and managerial implications of the research are discussed based on the findings of the study. Furthermore, limitations of the dissertation are argued and possibilities for future research are presented (Figure 3).

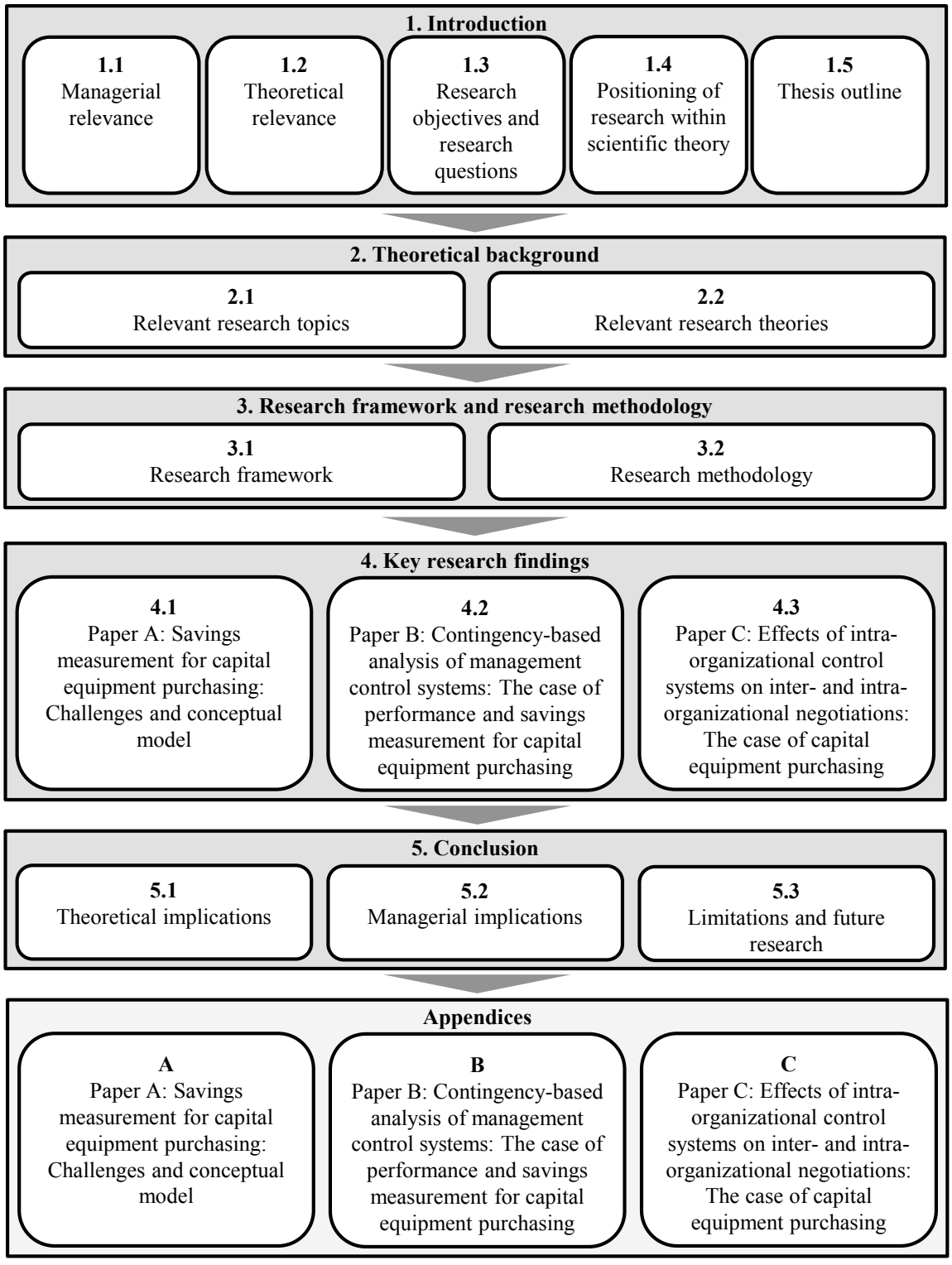

Figure 3: Thesis outline

2. Theoretical background

Based on the formulated RQs, the relevant research topics and research theories concerning savings measurement for CEP are discussed in order to form the theoretical basis for further analysis. Thereby, a funnel-shaped procedure is applied, which leads to CEP and savings measurement for CEP. In the second part, principal-agent theory, motivation theories and contingency theory are discussed with reference to their implications for the research topic.

2.1. Relevant research topics

2.1.1. Capital equipment

There is no standard definition for the term capital equipment. Furthermore, the terms capital goods and capital assets are often used interchangeably. However, some commonly cited definitions are presented in the following:

- Backhaus (1982, p. 3): "Capital equipment are goods that are acquired by organizations in order to make further goods that are not distributed to the final consumer."[3]
- Fearon et al. (1992, p. 655): "Items for which the cost is more properly chargeable to a capital account than to an operating expense account are generally classified as capital assets."
- Newman and Simkins (1998, p. 3): "Normally capital equipment is defined as any item having a service life in excess of three years and an item that must be depreciated as a capital asset."
- Large (2009, p. 12): Capital equipment are "tangible assets of the fixed assets."[4]
- Leenders et al. (2009, p. 423): "Capital assets are long-term assets that are not bought or sold in the regular course of business, have an ongoing effect on the organization's operations, have an expected use of more than one year, involve large sums of money, and generally are depreciated. Assets may be tangible or intangible."

[3] Own translation from German.

[4] Own translation from German.

For this dissertation, capital equipment is understood as tangible and intangible goods that are acquired by organizations and that provide the technical prerequisites for the creation of goods and services (Hofmann et al., 2012a). Table 1 shows a possible classification of capital equipment with some examples.

Table 1: Classification of capital equipment with examples (cf. Hofmann et al., 2012a)

	Standardized		Customized	
	Tangible	**Intangible**	**Tangible**	**Intangible**
Production-related	Standard milling machine	Patent for a production method	Customized hydraulic press	Customized production planning software
Not production-related	Office printer	Standard computer aided design software	Engine test stand	Customized human resource management software

2.1.2. Capital equipment purchasing

CEP differs significantly from the acquisition of other goods (e.g., production material, trade goods) and services (Dobler et al., 1990).[5] CEP can be characterized through features related to the product, purchasing process and parties involved (Hofmann et al., 2012a).

First, product-related characteristics of CEP are discussed. CEP is often associated with high financial stakes (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002; Talluri, 2002). Total cost of ownership (TCO) may be much higher than the acquisition price, because capital equipment often has a long economically reasonable useful life (Leenders et al., 2009). Thus, TCO is normally the most relevant cost factor (Burt et al., 2003; Dobler et al., 1990; Perry, 1987). TCO includes all the costs associated with the purchase (e.g., acquisition price, transaction and freight), possession (e.g., storage), use (e.g., energy, service) and disposal of a good (Ellram, 1995). However, TCO and revenues related to capital equipment are, for the greater part, uncertain, which leads to the challenge that the profitability of the investment is difficult to determine (Discenza & Gurney, 1990; Dobler et al., 1990; Leenders et al., 2009; Perry, 1987). Sometimes, the acquisition price even changes during the

[5] Section **Fehler! Verweisquelle konnte nicht gefunden werden.** is based on section 2.1 of the paper in appendix A.

purchasing process. As a consequence of the high costs and cash flow uncertainty, high risks can be associated with CEP (Leenders et al., 2009). Capital equipment often has a high rate of technological obsolescence. Thus, the economically optimal replacement time is normally shorter than the technical or legal replacement time and has to be determined (Poggensee, 2009). Concerning this, technology forecasting should be applied to be able to appropriately assess this question. Other aspects to be considered in CEP are interdependences with existing capital equipment in the established operating environment (Discenza & Gurney, 1990; Perry, 1987). Besides, capital equipment is often very technical in nature and corresponding expertise is required to assess proposals (Fearon et al., 1992). Additionally, capital equipment is often related to services, such as maintenance, repair and overhaul (Monczka et al., 2002). Furthermore, the capital equipment industry is highly dependent on economic trends, leading to a high variability of prices and delivery times for capital equipment (Dobler et al., 1990).

A major characteristic concerning the purchasing process is that, in many cases, capital equipment is purchased erratically (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002). This leads to the problem that purchasers often have limited experience in CEP (Holmes, 1991) and buying companies often have difficulties in gaining and maintaining the capabilities necessary for CEP (Flowers, 2007). Other process-related characteristics are that long-term business relations often exist between buyers and suppliers (Monczka et al., 2002) and, due to the low degree of standardization and high complexity, manufacturing lead times can be long (Burt et al., 2003; Dobler et al., 1990). The typical CEP process consists of the preparatory phase, agreement phase and the execution phase (Figure 4).

Finally, player-related CEP characteristics will be discussed. In many cases, especially for complex CEP projects, employees from different organizational units within the buying company form a buying center (Johnston & Bonoma, 1981; Mattson & Salehi-Sangari, 1993). In these circumstances, purchasing serves as a facilitator, coordinator and consultant for company functions (Burt et al., 2003; Dobler et al., 1990). However, due to the technical nature of capital equipment, purchasing is sometimes not involved in CEP at all (Fearon & Bales, 1995). Due to the high financial stakes and risks associated with CEP, several authority levels, including top management, are likely to be involved (Woodside & Liukko, 1999). For top management, CEP is often

a strategic issue (Dobler et al., 1990; Leenders et al., 2009). Furthermore, international relations and personal negotiations are important in CEP (Newman & Simkins, 1998). Figure 5 shows an overview of the challenges in CEP.

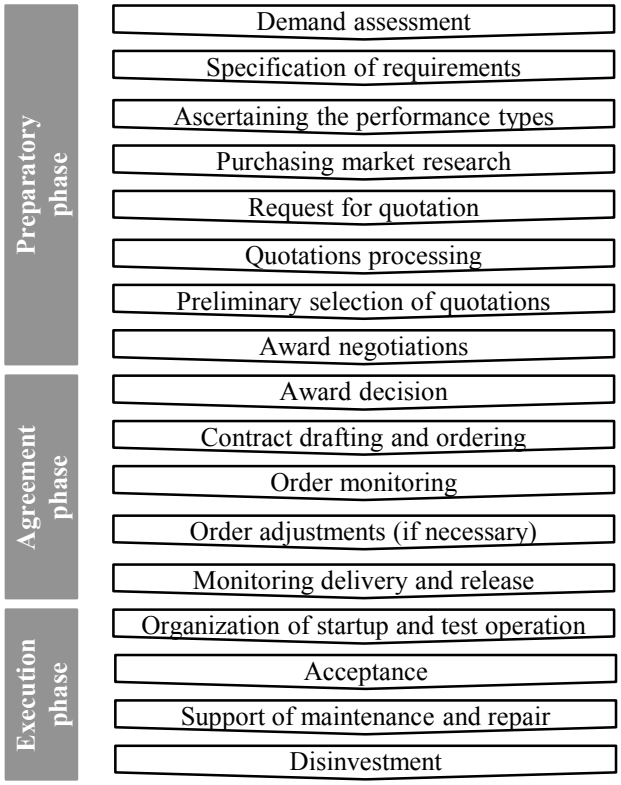

Figure 4: Capital equipment purchasing process (cf. Hofmann et al., 2012a)

CEP can differ substantially in each project, for example concerning the degree of dependency, the form of contact with the supplier or the investment type. Table 2 shows a possible classification of CEP forms.

2.1.3. Procurement control

Savings measurement for CEP, the focus of the analysis, is a component of procurement control. There is no generally accepted definition for the term procurement control (Kaluza, 2010). Friedl (1990) defines procurement control as the entirety of tasks that involve the coordination and information supply of purchasing. Arnold (1997) understands procurement control as a "system of guidelines that is conducive to ensure coordination, adaption, realization and innovation ability through

provision of methods and information" (p. 223).[6] According to Wagner and Weber (2006), the task of procurement control is to "apply concepts and instruments for an effective coordination of the collaboration between the company and its suppliers, in order to continuously improve procurement and to be able to make statements on procurement performance" (p. 9). Procurement control comprises the management of internal as well as external relationships (Stölzle, 2007).

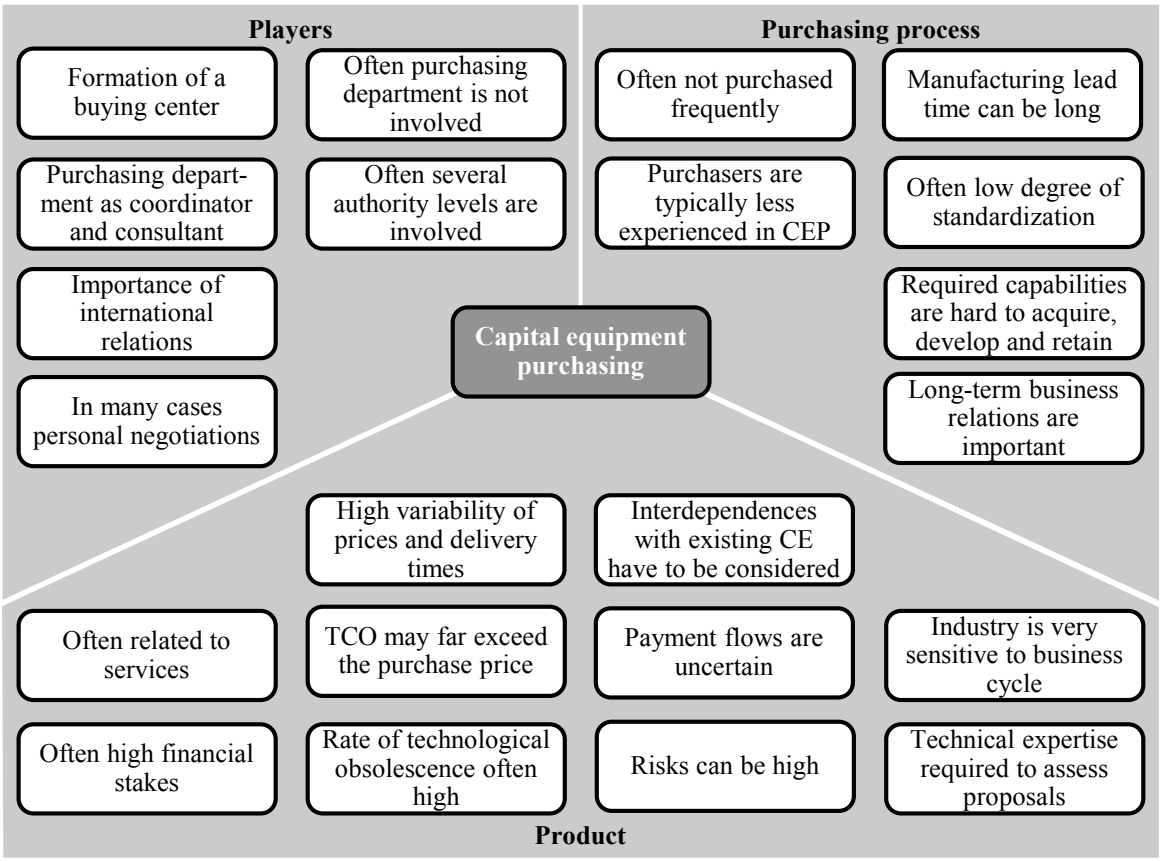

Figure 5: Challenges in capital equipment purchasing (cf. Hofmann et al., 2012a for an earlier version)

The three major elements of procurement control are results-oriented coordination, information supply and performance measurement (Arnold & Warzog, 2006). Within coordination, the main function is the contents coordination of purchasing actions with company and purchasing goals (Friedl, 1990). Information supply comprises the provision of necessary information for the purchasing process (Friedl, 1990). Finally, performance measurement deals with the measurement and presentation of the contribution of purchasing to the overall company performance (Arnold & Warzog,

[6] Own translation from German.

2006). Eßig and Präuer (2004) distinguish between three perspectives of procurement control: procurement control on the company level, supplier relationship control and supply chain controlling. Figure 6 shows the positioning of procurement control, procurement performance measurement and savings measurement in management accounting.

Table 2: Classification of capital equipment purchasing (cf. Hofmann et al., 2012a)

Procurement organization	Public authority		Enterprise
Degree of dependency	Individual transaction		Composite transaction
Purchasing region	National	Continental	International
Internal organization	Unipersonal		Multipersonal (buying center)
External integration	Involvement of other organizations		No other organizations involved
Invitations to tender	Yes		No
Contact with supplier	Personal contact		Anonymous
Investment volume in relation to annual investment volume	< 5%	5%-30%	> 30%
Leasing	Yes		No
Performance contracting	Yes		No
Investment type	New investment	Substitute investment	Expansion investment
Purchasing type	Initial purchase	Modified repeat purchase	Unmodified repeat purchase

In the literature and in corporate practice, various instruments have been developed to address procurement control tasks. In the following, some commonly used approaches and methods will be briefly described:

- Value engineering: According to DIN 69910, value engineering is "the systematic analytic penetration of function structures with the goal of an aligned interference of their elements (e.g., costs, benefits) in the direction of a value increase" (Koppelmann, 2003, p. 186).[7] The underlying assumption is that the product functions – not the product itself – are important for the customers (VDI, 2011). Further characteristics are a systematic procedure, teamwork and the application of creative techniques (Arnold, 1997). Besides, value engineering can be used to split products and services into cost parameters and

[7] Own translation from German.

with that to determine the cost price for the supplier. This information can be used for negotiations and process improvements.

- ABC / XYZ-analysis: The ABC / XYZ-analysis is an instrument to classify commodity groups and define different purchasing as well as warehousing strategies for each group (Scholz-Reiter et al., 2012). The instrument is a combination of an ABC-analysis, that is classification by means of the relative importance, and a XYZ-analysis, that is classification by means of demand forecast inaccuracy, leading to a nine-box grid (Arnolds et al., 2012).
- Activity based costing (ABC): ABC is a costing system that allocates resources (e.g., labor costs, machine costs) to activities, whereas traditional cost accounting systems allocate resources to products (Cooper & Kaplan, 1991). In procurement, ABC can be used, among other applications, to improve process costs (Boutellier & Locker, 1998). Furthermore, the method can be used for supplier selection by calculating total costs caused by a supplier and determining the cost drivers (Roodhooft & Konings, 1997).

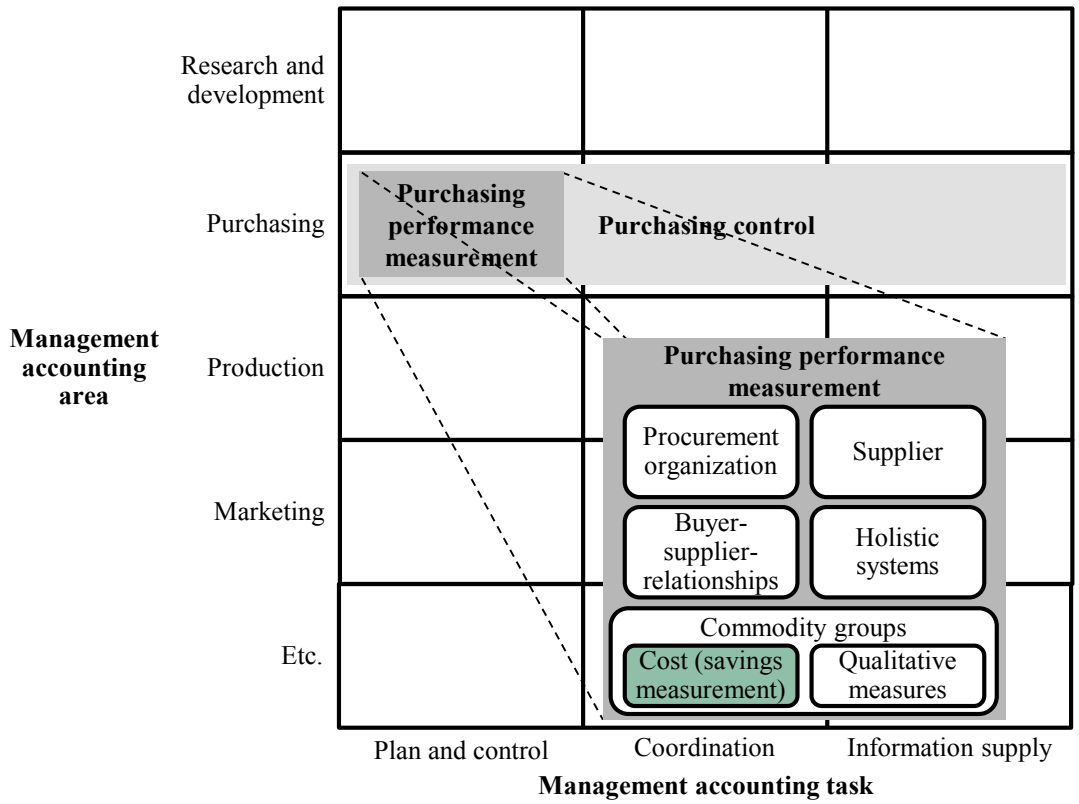

Figure 6: Positioning of procurement control, procurement performance measurement and savings measurement

For the organizational design of procurement control in companies, different possibilities exist. Common questions concern the hierarchical positioning and the centralized or decentralized organization of procurement control (Kaluza, 2010). Furthermore, the question of a separate organizational unit for procurement control is discussed (e.g., Kaufmann et al., 2005). Factors that should be considered for this question are the size of the purchasing volume, the procurement's importance for company performance, organizational positioning of procurement, number of employees in procurement and the distinction of procurement tasks (Schentler & Tschandl, 2010).

2.1.4. Procurement performance measurement and evaluation

Procurement performance measurement refers to the process of determining and displaying the efficiency and effectiveness of the procurement function (Maucher et al., 2012). Effectiveness expresses the extent to which targets are achieved (ratio of actual output to target output), while efficiency is a measure of how economically (ratio of actual input to actual output) the attained output is achieved (Neely et al., 2005). Relevant levels in procurement performance measurement are commodity groups, procurement organization, supplier evaluation, buyer-supplier-relationship and holistic performance measurement systems (Hofmann et al., 2012b).

Performance measurement on the level of commodity groups focuses on the purchased goods and services. Thereby, cost-oriented and qualitative approaches can be distinguished (Hofmann et al., 2012b). Cost-oriented approaches, commonly known as savings measurement, refer to the effectiveness of purchasing spend (Monczka et al., 2002). Qualitative approaches involve non-monetary performance measures, such as product quality.

Performance measurement on the level of the procurement organization aims at the evaluation of the organizational unit responsible for procurement-specific tasks (Kaufmann, 2001). A commonly used method in this context is benchmarking. Thereby, company-internal, sector-specific, cross sector and chronological comparisons can be done. According to empirical studies, the application of

procurement benchmarking is regarded as positively related to procurement and company performance (Carr & Smeltzer, 1999; Sánchez-Rodríguez et al., 2003).

Supplier evaluation helps to objectively assess suppliers according to generally defined criteria and it can be applied in supplier selection or for existing suppliers. For this purpose, different evaluation methods (e.g., scoring model, data envelopment analysis, fuzzy logic) and ratios (e.g., on-time delivery performance, price, product quality) are available (Hofmann et al., 2012b). With the supplier lifetime value (SLV), Eßig (2003) developed an instrument to measure the value added of individual suppliers. The SLV represents the present value of incoming and outgoing payments related to the suppliers. Outgoing payments are, for example, acquisition and transaction costs associated with suppliers. Incoming payments can be future savings potentials in procurement and the supplier's contribution to the competitive advantage.

Due to stronger supplier power and closer relationships between the buying company and its suppliers in many cases, performance measurement of this relationship is becoming increasingly important (Gebert, 2011). Relevant performance dimensions for buyer-supplier-relationships are flexibility and performance capability, cost efficiency, process quality and forecast accuracy as well as effectiveness (Hofmann et al., 2012b).

Finally, holistic performance measurement systems, such as the PVA, the P-BSC and other ratio systems, are used to aggregate and concisely show different quantitative and qualitative procurement performance measures. The PVA measures the monetary valued added of the procurement function with a calculation scheme based on the economic value added approach and delivers a KPI (Maucher et al., 2012). The PVA represents the procurement's residual profit, that is the surplus of the operative profit over cost of capital that can be influenced by procurement (Hofmann et al., 2012b). The P-BSC is a tool to display financial as well as non-financial procurement performance measures. In addition to the four perspectives in the traditional balanced scorecard – financial perspective, customer perspective, internal business perspective as well as innovation and learning perspective (Kaplan & Norton, 1992) – the P-BSC is extended with the supplier perspective (e.g., Kaufmann et al., 2005; Stölzle et al., 2001; Wagner, 2004).

Concerning performance measurement for CEP, commonly used performance measures are acquisition costs / TCO, quality, delivery time, product quality and

safety. As a consequence of capital equipment and CEP characteristics, performance measurement faces certain challenges, such as the difficulty of designating success to individual employees, the high variability of prices and delivery times and the difficulty of considering long-term business relations and trust within performance measurement.

Subsequent to performance measurement, the attained results are evaluated by superiors, management, etc.. The evaluation process is not done by means of rules and guidelines, but depends strongly on the personal judgment of the individual. For example, several experiments show that the dimensions of a balanced scorecard are weighted differently in a holistic evaluation of human subjects (e.g., Banker et al., 2004; Dilla & Steinbart, 2005; Lipe & Salterio, 2000; Lipe & Salterio, 2002). This feature is also relevant concerning the evaluation for CEP, when the varieties of monetary, quantitative and qualitative performance measures are evaluated.

Furthermore, incentive systems are closely related to performance measurement. It is assumed that well-designed and aligned incentive and performance measurement systems affect purchasers' motivation to use their skills according to the company goals (Pagell & Das, 1996). In corporate practice, about 40% of companies use incentive systems in procurement, with a higher usage rate in larger companies and a variable salary share of about 6-20% (Stoppel et al., 2012).

2.1.5. Savings measurement

Savings measurement involves the capture, calculation and display of price-related purchasing performance concerning the acquisition of goods and services.[8] Although a renunciation from the primary focus on price and cost measures in procurement is urged in the academic literature (Eßig, 2007; Wildemann, 2004), savings are still the prevalent performance measure with a usage rate in corporate practice of more than 90% (CAPS Research, 2011; Daxböck et al., 2011; Dumond, 1994; Quitt, 2010). Within the scope of a holistic procurement performance measurement, savings measurement is, among other categories (e.g., quality, availability, supplier performance), an important part (Beidelman, 1987).

[8] Section 2.1.5 is based on section 2.2 of the paper in appendix A, section 2.2 of the paper in appendix B and section 2.1 of the paper in appendix C.

According to Nollet et al. (2008) and Dmytrenko (1997), basically three savings types can be distinguished. Hard as well as soft savings refer to real cost changes and cost avoidance refers to possible hypothetical cost changes:

- Hard savings are monetary cost reductions with a direct and easy-to-calculate impact on the profit (e.g., price reductions, staff cuts).
- Soft savings are non-monetary cost reductions with an indirect and difficult-to-calculate impact on the profit (e.g., purchasing process improvements, quality improvement of the purchased goods and services).
- Cost avoidance are reduced or eliminated possible future costs, for example through resisting, reducing or deferring an announced price increase from an established supplier (Ashenbaum, 2006).

Hard savings are quantitative savings that directly impact the bottom line and are easy to calculate (Dmytrenko, 1997; Nollet et al., 2008). Reductions in price, in staff, or in transaction costs are examples of hard savings (Dmytrenko, 1997). Soft savings are qualitative savings that have an indirect, and difficult to calculate, impact on the bottom line, such as increases in productivity (Dmytrenko, 1997; Nollet et al., 2008). Cost avoidance is related to the reduction or elimination of a possible future cost (Dmytrenko, 1997), for example resisting or delaying an announced price increase (Ashenbaum, 2006).

In corporate practice, various methods are applied to calculate savings in different constellations, whereby all methods compare an actual paid price with a defined reference price. Basically, cost change (hard and soft savings) and cost avoidance savings calculation methods can be distinguished. Cost change measures compare actual paid prices with previous paid prices that can be adjusted to, for example, market indexes or purchasing volume developments (Monczka et al., 2002; Smeltzer & Manship, 2003). Cost avoidance measures make use of hypothetical prices, which might have occurred if purchasing had not obtained any countermeasures, as reference prices (Monczka et al., 2002; Smeltzer & Manship, 2003). Commonly used hypothetical prices are: catalog prices, planned prices (e.g., budgets), target prices, average offers / average of selected offers, offers of the selected supplier and prices paid by other organizational units (Monczka et al., 2002; Smeltzer & Manship, 2003).

2.1.6. Savings measurement for capital equipment purchasing

Concerning savings measurement for CEP, some of the generally applied reference prices cannot be used in any condition. As capital equipment is often purchased infrequently, the most common reference price for production material – previous paid prices – is not available. Furthermore, a significant share of capital equipment is customized, so catalog prices are also unavailable.

In addition to the already mentioned problems, savings measurement for CEP faces further challenges in comparison to other goods and services. With reference to the CEP challenges (section **Fehler! Verweisquelle konnte nicht gefunden werden.**), these challenges can be differentiated into player-related, process-related and product-related challenges.

Player-related challenges result from the common formation of buying centers, the low involvement of the purchasing function and personal negotiations. If several players from different organizational units are involved in CEP, it is often unclear how the calculated savings can be allocated to the different players. Furthermore, if the purchasing function is not involved in CEP, it is difficult to apply the savings calculation methods and to aggregate the results. Personal negotiations and long-term business relations can lead to the problem that buyers and suppliers know each other quite well and therefore the initial offer price might be manipulated. The main process-related challenges concern the intermittent acquisition and the low degree of standardization of capital equipment leading to the problem of missing reference prices. Product-related challenges encompass, for example, the requirement of technical expertise to assess proposals, the high variability of prices and delivery times, high risks and uncertainty, interdependences with existing capital equipment and the relevance of TCO. The requirement of technical expertise makes it difficult for purchasing to evaluate if the highest possible savings are actually realized. The economic situation should be considered in savings measurement for CEP, because of the high variability of prices and delivery times. As a consequence of the risk and uncertainty associated with CEP, savings should be calculated at different points in time. Furthermore, interdependences and TCO have to be considered in savings measurement for CEP.

2.2. Relevant research theories

In the following section, an assortment of relevant research theories for the analyzed research topic is described. Commonly used research theories explaining procurement performance measurement are system theory and cybernetics (procurement performance measurement as a feedback control loop), principal-agent theory (procurement performance measurement to reduce information asymmetries) and the resource-based view (procurement performance measurement as a capability) (Hartmann et al., 2008a). As behavioral aspects play an important role in savings measurement for CEP, theories in this research field are also crucial. Relevant research theories in behavioral management accounting are, for example, principal-agent theory (information asymmetries in accounting), game theory and psychological motivation theories (e.g., incentives) (Gillenkirch & Arnold, 2008). Furthermore, for the successful design of savings measurement for CEP, the relevant contextual factors have to be considered. Therefore, contingency theory is the prevalent logic in research on MCS (Dent, 1990).

In the following, principal-agent theory, motivation theories and contingency theory are discussed with reference to savings measurement for CEP. These theories are discussed because they are regarded to have the strongest influence on the research topic of this dissertation.

System theory and cybernetics can help to describe the control process (planning, regulation, control path and control) concerning savings measurement for CEP. But the complete control process is not the focus of this dissertation. The resource-based view assumes that valuable, rare, inimitable und non-substitutable resources create a competitive advantage (Barney, 1991). However, savings measurement for CEP in corporate practice does not normally meet these requirements. Game theory focuses on interpersonal decision situations and considers strategic interactions between the involved parties (Fudenberg & Tirole, 1991) and assumes that the involved parties behave rationally and try to maximize the individual benefit (Jost & Audretsch, 2001). Certainly, behavioral economics, which is the basis for the research on behavioral aspects in savings measurement, rejects the homo economicus model (Altmann et al., 2009). This is why system theory and cybernetics, the resource-based view and game theory are not discussed in detail.

2.2.1. Principal-agent theory

The principal-agent theory deals with relationships between the involved actors of a transaction (Hochhold & Rudolph, 2011). Jensen and Meckling (1976) define a principal-agency relationship as a "contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent" (p. 308). The theory offers insights for the design of contracts and attempts to explain transactions in the economic world (Arrow, 1984).

The chronological process of the transaction process is specified as follows (cf. Sappington, 1991):

1. The principal designs the contract and offers the contract to the agent.
2. The agent has the option to accept or deny the contract, but is not able to make a counteroffer (take-it-or-leave-it).
3. If the agent accepts the contract, he / she starts with the task and decides how much effort he / she puts into the task.
4. The task accomplishment is finished.
5. The agent's performance is evaluated, and the principal makes the payments to the agent.

In procurement, several principal-agency relationships exist (cf. Hofmann et al., 2012b):

- Corporate management (principal) charges the CPO (agent) to head the organizational procurement unit.
- The CPO (principal) instructs the procurement employees (agents) to do all necessary procurement tasks (e.g., supplier selection, negotiations).
- The buying company (principal) awards a contract to the supplier (agent) to supply the buying company with goods and services (cf. Kaluza et al., 2003).

The contract contains information about the agent's task and the payment of the principal to the agent. Due to the infinite diversity of contingencies and the related contract costs, it is not possible to design a complete contract in practice. The theory assumes a goal conflict between the principal and the agent. While the principal is

interested in a high effort and low payment, the agent strives for low effort and high payment.

Information on characteristics concerning the task accomplishment is unequally distributed between the principal and the agent. In general, three different types of information asymmetries are distinguished (cf. Alparslan, 2006):

- Hidden characteristics: The principal has an information deficit regarding the characteristics of the agent, such as preferences and performance capability. In recruiting for purchasers, for example, the CPO is only able to evaluate the candidates' behavior in the application process and the relevant documents, but not the real capabilities concerning the procurement tasks.
- Hidden actions: The principal is unable to observe the agent's actions and the exogenous uncertainty (e.g., economic influences, decisions and actions of other players). For the case of procurement, the CPO is often unable to observe negotiations between purchasers and suppliers and evaluate the influence of economic trends on prices.
- Hidden information: The principal has no information concerning exogenous uncertainty. An example in procurement would be if the CPO does not know about price competition between suppliers and consequently possible price reductions are not attained.

Information asymmetries lead to several problems in the principal-agency relationship. A classic example for a problem resulting from hidden characteristics is the lemons problem. In the automobile market, sellers of used cars have more knowledge about the car's quality than the buyers (Akerlof, 1970). Buyers consider the risk and reduce the amount they are willing to pay, because they do not know if the car is a good or bad car ("lemon"), leading to a displacement of good cars. Another problem related to hidden characteristics is the danger of adverse selection. If the principal offers a contract designed for average agents, agents with bad characteristics will try to act as agents with good characteristics and agents with good characteristics will decline the contract, leading to an attraction of bad agents (Jost, 2001). While adverse selection refers to information asymmetries before contract formation, moral hazard describes situations where information asymmetries occur after contract formation through hidden actions or hidden information (Hochhold & Rudolph, 2011).

However, the principal-agent theory is also subject to criticism. The criticism mainly deals with the realism of the underlying assumptions, the simplicity of the analyzed models and the missing statements regarding simple contracts that are often used in corporate practice (Baiman, 1990).

In the academic literature, the principal-agent theory is also discussed with reference to managerial control comprising, for example, systems of monitoring, budgeting, variance investigation, cost allocation and transfer pricing (Baiman, 1990).

Savings measurement can be used to improve the relationships in CEP. Allowing for the principal-agent theory, the following measures in savings measurement for CEP can support a reduction of information asymmetries in CEP (cf. Hartmann et al., 2008a):

- Establishment of a CEP savings standard through derivation of a procurement strategy from corporate strategy, elaboration of a specific CEP strategy and breaking down the CEP strategy into concrete goals on the individual level.
- Definition of a resilient savings measure for CEP that takes into account exogenous uncertainty to measure the realistic purchasers' performance.
- Integration of the savings measure for CEP into a procurement performance measurement system and indemnity of a regular reporting of the measure to the CPO.
- Connection of the CEP savings measure with individual incentive systems to align the purchasers' goals with CEP and corporate strategy.

Furthermore, the principal-agent theory makes statements on the incentive intensity of the CEP savings measure. For example, the measures should be more closely related to incentive systems the lower the risk aversion of the agents, the lower the variance of the savings measure (accuracy or quality of savings measurement) and the fewer the possibilities to manipulate the measure (cf. Pfaff & Pfeiffer, 2001). The quality of a CEP savings measure depends on its sensitivity to the CEP actions, its precision with which the CEP actions are involved, and the influence of the CEP actions on the procurement success (cf. Indjejikian, 1999). If the CEP savings measure is strongly influenced by exogenous uncertainty, several performance measures should be integrated into the incentive system (Hofmann, 2001).

These derivations from the principal-agent theory have to be considered individually for the design and the incentive intensity determination of CEP savings measurement systems for each case of application. Some CEP savings calculation methods offer possibilities for manipulation (e.g., asking the supplier for a higher initial offer) and the savings are also often influenced by exogenous factors (e.g., economic trends). Therefore, savings measures for CEP should be used in combination with other CEP performance measures for incentive systems.

2.2.2. Motivation theories

Motivation, in an organizational context (work motivation), is defined as "a set of energetic forces that originate both within as well as beyond an individual's being, to initiate work-related behavior and to determine its form, direction, intensity, and duration" (Latham & Pinder, 2005, p. 486). Thereby, extrinsic motivation (motivation from a task itself) and intrinsic motivation (motivation from consequences and results of a task) are distinguished. A person's motivation is influenced by personal determinants, for example needs, motives, goals, and situational determinants, such as opportunities, incentives (Heckhausen & Heckhausen, 2010).

Motivation theories attempt to describe and explain behavior and its characteristics (Staehle, 1999). There is no holistic and complete motivation theory, but many different approaches that can be distinguished in content, process and hybrid theories (Mayer, 2011):

- Content theories focus on the contents of motivation, such as concrete motives and their classification. Examples include the motivation theory by Maslow (1943), the ERG (existence, relatedness and growth) theory of motivation by Alderfer (1969; 1972), the two-factor theory by Herzberg (1968), the achievement motivation theory by McClelland (1961) and the theory of motivation by Reiss (2002).
- Process theories deal with cognitive processes concerning motivation. Examples include Vroom's (1994) expectancy theory of motivation, Porter and Lawler's (1968) model of motivation and Adams' (1963) equity theory.
- Hybrid theories consider both the content and the process of motivation. Important representatives are the model of motivation by Heckhausen and

Heckhausen (2010), the self-determination theory by Deci and Ryan (1993) and the flow theory proposed by Csikszentmihalyi (2009).

Especially the theories by Herzberg, McClelland, Adams and Maslow allow statements on management control and performance measurement. Therefore, these theories are described in the following and discussed with reference to savings measurement for CEP.

Two-factor theory by Herzberg

Herzberg analyzed the reasons for satisfaction and dissatisfaction among 203 accountants and engineers by utilizing semi-structured interviews. Thereby, he found that two different classes of reasons (factors) were used for satisfaction and dissatisfaction (Herzberg, 1968; Staehle, 1999):

- Hygiene factors are extrinsic; they focus on the job context and avoid dissatisfaction, but do not cause satisfaction. Examples are company policy, supervision, interpersonal relationships, working conditions, salary and security.
- Motivator factors are intrinsic; they are related to the actual task and cause satisfaction. Examples are achievement, recognition, interesting work, responsibility and advancement.

Criticism of the two-factor theory by Herzberg focuses on the limited replicability of the results. The results could only be replicated if exactly the same methodological design was applied (Steinmann & Schreyögg, 1993). The theory has two basic implications on managerial control and performance measurement. First, to support recognition and advancement, performance measurement systems should measure and report objective results (Riahi-Belkaoui, 2002). Second, to make the work more interesting, managerial control should support job enrichment, for example, through increasing the employees' accountability for their own work and making periodical performance reports directly available to the affected employees (Evans, 1970). These implications are also true for the case of savings measurement for CEP. Therefore, the calculation methods should be designed by involving the affected employees to ensure the acceptance and objectivity of the results. Furthermore, savings measurement for CEP should support a broadening of employees' accountability, for example by making the purchasers responsible for the CEP process and not only for the results.

Achievement motivation theory by McClelland

According to McClelland, needs are learned in the socialization process and only three needs are really important (c.f. Staehle, 1999):

- Need for achievement: Persons with a strong need for achievement prefer a performance-oriented environment (e.g., sales).
- Need for power: Persons with a strong need for power prefer a power-oriented environment (e.g., production).
- Need for affiliation: Persons with a strong need for affiliation prefer an interaction-oriented environment (e.g., consulting).

The main focus of the theory is the need for achievement. In this context, McClelland states that professional success is linked with a high need for achievement (Drumm, 2005). Furthermore, McClelland (1993) found that there is a positive correlation between achievement levels of populations and economic growth rates of countries. However, it has to be critically stated that the theory does not answer how the needs influence each other and how the needs develop chronologically (Mayer, 2011). The implications for managerial control are that the need for achievement should be supported by management control and success-oriented employees should receive a rapid performance feedback (Riahi-Belkaoui, 2002). Thus, the CEP savings results should be calculated and reported rapidly.

Equity theory by Adams

The perception of subjective fairness is critical for motivation (Kühn et al., 2005). Adams (1963) states that persons compare their own subjective input-output-ratio with other persons (Staehle, 1999). If they identify an inequity, they try to adjust the ratio by increasing or decreasing input or output. Thereby, the easiest possibility will be selected (Drumm, 2005). Inputs are, for example, education, age, effort, skills and typical outputs are money, status or leverage (Nerdinger et al., 2011). In a working environment, employees can reduce work performance and effort or ask for salary increases if they perceive an unfair input-output-ratio (Mayer, 2011). Empirical studies confirm the statements of the theory; however, it is criticized because the subjective perception depends on the observed persons (Staehle, 1999).

The implication for management control is that rewards must appear fair and equitable for all employees, for example through making public the performance measurement

methods and rewards to the employees (Riahi-Belkaoui, 2002). This, of course, is also true for savings measurement for CEP. Furthermore, it has to be considered that fairness is an especially relevant topic in buying centers, when several employees from different departments are involved in CEP. Therefore, savings measurement for CEP should be fair for all involved employees, for example technicians and purchasers.

Motivation theory by Maslow

Maslow's motivation theory states that basic human needs are arranged hierarchically according to their prepotency. These basic needs are (in ascending order) as follows:

1. Physiological needs, for example breathing, food, water.
2. Safety needs, for example security of health, employment, property.
3. Love needs, for example friendship, partnership, family.
4. Esteem needs, for example self-respect, self-esteem, independence, freedom.
5. Self-actualization needs, for example creativity, problem solving.

If the first step in the pyramid of needs is satisfied, the second step influences human behavior, and so on. In the concept, only the hierarchically lowest unsatisfied basic need has a motivating effect (Mayer, 2011). However, in reality each basic need is often only partially satisfied. Therefore, if a basic need is mainly satisfied (e.g. 75%), the next basic need emerges (Maslow, 1943). Criticisms of Maslow's motivation theory mainly concern the negligence of negative human behaviors, the missing connection between the satisfaction of needs and actual behavior as well as the missing empirical foundation of the theory (Mayer, 2011).

Maslow's motivation theory also has some implications for managerial control and performance measurement. On the supposition that employees are paid well, the focus in managerial control should lay on control systems that address the satisfaction of higher level needs (Caplan, 1971). The theory also gives hints referring to savings measurement for CEP. For example, the savings calculation method for CEP should allow self-actualization in CEP, such as creative ways in the purchasing process. Furthermore, the savings results should not only be connected to the monetary incentive system, but also to recognition by superiors and colleagues.

Implications for savings measurement for CEP

In the following, the implications of the described motivation theories for savings measurement for CEP are summarized:

- CEP savings measurement systems should measure and report objective results, support job enrichment and make performance reports periodically available to the affected employees.
- CEP savings results should be calculated and reported rapidly.
- Savings measurement for CEP should be transparent and fair for all employees involved in CEP.
- The savings calculation method for CEP should allow self-actualization in CEP and the savings results should enable recognition by superiors and colleagues.

As even small misguided incentives can lead to wrong behavior, the calculation method, the reporting and the linked incentive system should be carefully designed according to the company and CEP goals.

2.2.3. Contingency theory

Contingency theory focuses on analyzing organizational structures and therefore belongs to the organizational theories, but differs from other theories in emphasizing that "it all depends" (Hambrick & Lei, 1985).[9] The principal message of contingency theory is that organizational performance depends on the fit between the internal and external situation of an organization (contingent factors) and its procedural and organizational characteristics (Donaldson, 2001). Thereby, the organization's characteristics are defined as dependent (explained) variables and the organization's situation as independent (explanatory) variables. Common contingent factors are, for example, environment (economic trends, competition), industry, company size, strategy and structure. The theory states that organizations are shaped by contingencies, because they try to achieve the fit by adapting their characteristics to obtain a better performance (Donaldson, 2001). The major practical contribution of contingency theory are statements concerning the appropriate organizational design for the organization's particular context (Sousa & Voss, 2008). Criticism concerning contingency theory mainly refers to the insufficient clarity in theoretical statements. For that reason, contingency theory is sometimes not considered as a "real theory", but rather as a guidance or metatheory (Schoonhoven, 1981).

[9] Section 2.2.3 is partially based on section 1 of the paper in appendix B.

Contingency theory is the prevalent theory for research on MCS (Dent, 1990). Concerning MCS, the theory argues that best practice MCS do not exist, but appropriate MCS designs depend on the relevant contingent factors (Otley, 1980). A common example is that MCS with tight rules should be used in centralized organizations and MCS with fewer rules in decentralized organizations (Covaleski et al., 1996). Contingent MCS studies can be classified according to their complexity level (number of contingent factors, control mechanisms and outcome variables) into different categories (Fisher, 1995).

Contingency-based MCS research is quite comprehensive and several frameworks are presented. For example, Otley (1980) provides a framework in which organizations try to obtain a fit between MCS and contingent factors by configuring MCS appropriately. The organizational performance is regarded as influenced by MCS and contingent as well as other factors.

Fisher (1995) develops an MCS framework consisting of an iterative feedback loop. Thereby, manageable contingency factors (e.g., strategy) influence non-manageable contingency factors, which in turn affect the control system (e.g., cybernetic control systems). The control system sways, together with other factors, the effectiveness and efficiency outcomes. The feedback loop closes with measurement and linked rewards.

Chenhall (2003) conducts a meta-analysis on MCS contingency research by analyzing academic articles from 1983 to 2003. The focus of the analysis lies on the outcomes of MCS as well as the relevant contingent factors (external environment, technology, organizational structure, size, strategy and national culture). As a result, 25 propositions about the contingent factors were formulated and critically evaluated.

Concerning the special topic of performance measurement, Riahi-Belkaoui (2002) summarizes major contingencies:

- Organizational technology (work activities)
- Perceived environmental uncertainty and organizational structures
- Performance measurement complexity (e.g., products range and diversity, seasonal variations)
- Degree of automation
- Manufacturing controls (inventory, production, incentives, quality control)

- Motivation of managers to implement new performance measurement techniques
- Use of executive support systems
- Self-interest and ethical considerations
- Matching of performance measurement with contextual variables

With respect to the special case of savings measurement for CEP, no studies are known that analyze contingencies. As savings measurement for CEP is a subtopic of general performance measurement, accordances concerning contingencies can be expected. However, due to the special characteristics and challenges of savings measurement for CEP, there might also be some differences.

2.2.4. Interim conclusion on the research theories

The three discussed research theories all have implications for the topic of savings measurement for CEP. The principal-agent theory offers suggestions on the design of savings measurement for CEP. Thereby, the goal should be to reduce information asymmetries. The theory emphasizes the importance of an objective, precise and adaptable savings measure. In the following, these implications have to be considered when formulating recommendations concerning the RQs.

The motivation theories also make recommendations on savings measurement for CEP. Essential topics concern objectivity, fairness, rapidness and support of motivational factors. Thereby, motivation theories make similar suggestions as the principal-agent theory. However, while principal-agent theory assumes rational behavior, motivation theories also consider social aspects. The implication of the motivation theories are also taken into account for suggestions on the design of savings measurement for CEP.

Finally, contingency theory states that CEP performance depends on the fit between savings measurement for CEP and the relevant contingency factors. To be able to establish a fit, the relevant contingencies have to be known. Although the general topic of performance measurement for some relationships is already known, the topic of savings measurement for CEP is still unexplored and needs to be addressed within this dissertation.

3. Research framework and research methodology

In this section, the research framework, including a positioning of the RQs within the framework, is presented. In the next step, the applied research methodologies are analyzed concerning their appropriateness for the research topic and their specific design and procedure is described.

3.1. Research framework

Research frameworks serve to illustrate the subjective perspective of the researcher, which is affected by their academic school and job as well as private socialization (Kubicek, 1977). Furthermore, research frameworks can serve to display isolated hypotheses and results in the general research context or to display operationalization rules. In general, conceptual frameworks and heuristic frameworks are distinguished. Heuristic research frameworks clarify the researcher's position through questions and interpretation patterns (Kubicek, 1977). Conceptual frameworks graphically display theoretical constructs and variables through boxes and supposed relationships through lines (Wolf, 2008). Conceptual frameworks are especially useful if contingencies of the research topic are relevant (Jochims, 2006). As this is the case for the current dissertation, a conceptual framework is presented in the following.

The focus of the analysis is on savings measurement for CEP. According to the practical relevance, RQ1 focuses on challenges, procedures and methods concerning savings measurement for CEP. In order to understand the interaction with savings measurement for CEP, companies' internal as well as external characteristics have to be analyzed. Performance measurement for CEP forms the framework and is closely related to savings measurement for CEP. Furthermore, evaluation of the performance result is an important part of the control process. Therefore, in a contingency analysis concerning savings measurement for CEP, the larger framework should also be considered (RQ2). Finally, behavioral aspects play an important role in savings measurement for CEP. For that reason, RQ3 analyzes the influence of applied procedures and methods in savings measurement on behavioral aspects in CEP, such as behavior in negotiations. For the purpose of completing the research framework, the relevant research theories (principal-agent theory, motivation theories and contingency theory) are displayed with reference to the preliminarily addressed RQ. Concerning

RQ1, principal-agent theory is applied to formulate improvement suggestions for procedures and methods of savings measurement for CEP. Contingency theory forms the basis of the analysis related to RQ2. In addition, motivation theories are used to discuss and explain the findings on behavioral aspects concerning savings measurement for CEP (RQ3). Figure 7 shows the graphical (conceptual) research framework of this dissertation.

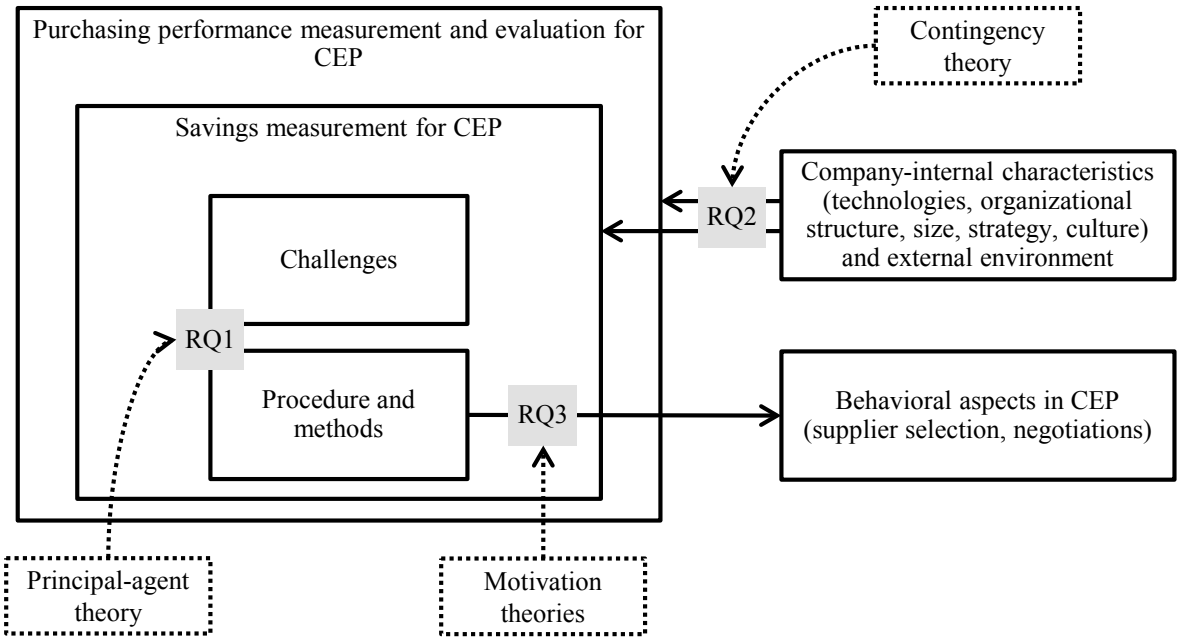

Figure 7: Research framework

3.2. Research methodology

The research combines descriptive, exploratory and deductive research. The research methodology is structured into three research phases (Figure 8). In the first research phase, which is related to Paper A ("Savings measurement for capital equipment purchasing: Challenges and conceptual model"), a general overview of the research field is given. Answering RQ1 is the focus of this research phase. However, RQ2 is also addressed on a basic level. The main methods of data collection in this research phase are qualitative interviews and a literature review. The data analysis is conducted through conceptual considerations. Research phases 2 and 3 both build on the results from the first research phase.

In the second research phase, which builds on research phase 1, RQ2 is addressed in detail. The second research phase is related to Paper B ("Contingency-based analysis

of management control systems: The case of performance and savings measurement for capital equipment purchasing"). Thereby, contingencies of performance and savings measurement for CEP are analyzed and qualitative interviews with 18 companies are conducted. The design and the data collection procedures in research phase 2 correspond with the first research phase. Furthermore, a qualitative data analysis is applied.

In research phase 3, which is related to Paper C ("Effects of intra-organizational control systems on inter- and intra-organizational negotiations: The case of capital equipment purchasing"), behavior-specific aspects of savings measurement for CEP will be tested with two laboratory experiments. The analysis is mainly based on results from research phase 1; however, findings from research phase 2 are also considered. For the analysis of the gathered data, statistical methods are applied.

In the following, the applied research methodologies for each research phase are presented in detail and discussed with reference to their appropriateness.

3.2.1. Descriptive and exploratory analysis

In research phase 1, descriptive case studies are applied to answer RQ1 and a literature review addresses RQ2.[10] In detail, the following RQs are asked:

- RQ1a: How do companies measure savings for CEP and which methods are used?
- RQ1b: What are the main challenges for companies with savings measurement for CEP?
- RQ2a: Which determinants influence and what are the effects of savings measurement for CEP?

Descriptive case studies with qualitative interviews are used to describe the CEP savings measurement process, methods and challenges in corporate practice. Descriptive case studies seem to be appropriate in the first research phase, because the topic has not been explicitly analyzed in the academic literature so far (Eisenhardt, 1989) and relevant variables and influences in this topic are not yet known (Dul & Hak, 2007). Furthermore "how questions" are partially addressed and control of

[10] Section 3.2.1 is based on section 3.1 of the paper in appendix A.

behavioral events is not required (Yin, 2009). For this purpose, a multiple-case design is applied with "savings measurement for CEP within a company" as the single unit of analysis (cf. Yin, 2009).

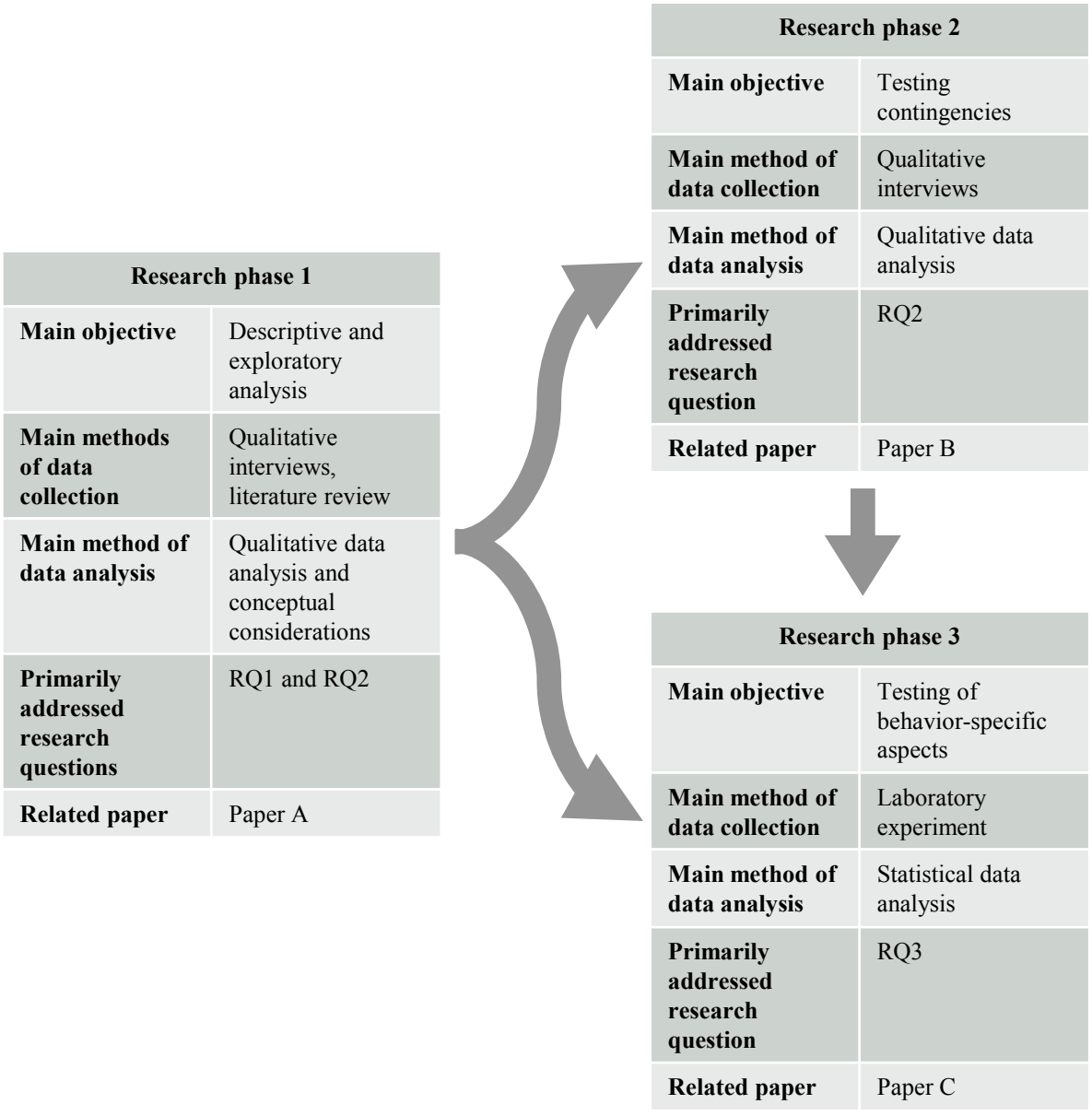

Figure 8: Research phases

Savings measurement for CEP is above all applied in larger manufacturing companies. In order to be able to answer the RQs, companies were selected that all apply savings measurement for CEP, but use different methods and face different challenges. For the case selection, variation strategy with reference to company size, capital equipment spending and industry was applied to maximize information utility (Flyvbjerg, 2006). For this purpose, a smaller manufacturer for the construction and building maintenance industry, a large manufacturer of construction materials and a very large chemical

company were selected. Five interviews are conducted using a semi-structured interview guideline (Fontana & Frey, 2000) and relevant company documents as well as statistical information are analyzed to gain further information.

In order to discuss the identified challenges and address RQ2a, a literature review is conducted. For this, literature on procurement management accounting and procurement performance measurement, behavioral management accounting and procurement organization is included. The literature review was conducted using Google Scholar, EBSCOhost and ProQuest. Thereby, an iterative process was applied starting with search keywords. In the next step, citations and "cited by" of the identified articles were analyzed leading to new search keywords. Based on the literature review, initial propositions (IPs) and a preliminary conceptual model concerning savings measurement for CEP are developed.

3.2.2. Testing contingencies

In research phase 2, case studies are applied to answer RQ2. Thereby, the following sub-RQs are addressed:

- RQ2b: How do contingent factors influence performance and savings measurement for CEP?
- RQ2c: How do contingent factors differ between MCS in general compared with performance and savings measurement for CEP?

Due to the close relationship to the main research topic, performance measurement for CEP is also involved in the analysis. The reasons for the appropriateness of case studies correspond to those in the descriptive analysis: the topic has not been analyzed so far (Eisenhardt, 1989), relevant variables are not known (Dul & Hak, 2007), answering of "how questions" and control of behavioral events is not required (Yin, 2009). Furthermore, case studies are the preferred research methodology for the analysis of contingency-based relationships in MCS (Chenhall, 2003). "Performance and savings measurement for CEP within a company" is the single unit of analysis in a multiple-case design (cf. Yin, 2009).

The study has a deductive and comparative character because several case studies are used to test a theory. The findings of this research phase on performance and savings measurement for CEP are compared with general propositions formulated by Chenhall

(2003), who conducted a meta-analysis on MCS contingency research. In order to ensure validity and reliability in the study, several measures, such as multiple interviewers, triangulation and multiple case studies were applied.

Case selection was exerted on the company level and the individual interviewee level (Holschbach & Hofmann, 2011). In this research phase, variation strategy with reference to company size, industry, spend, function within the company, etc. was also applied (cf. Flyvbjerg, 2006). Due to the applied variation strategy and the wide range of propositions to be tested, a relatively large number of cases (18) was chosen.

During data collection, interviews and analysis of financial information as well as internal company documents were combined to attain triangulation (cf. McCutcheon & Meredith, 1993). The focus in data collection was on semi-structured interviews lasting from one and a half to three hours each (cf. Fontana & Frey, 2000; Rubin & Rubin, 1995). Whenever possible, the interviews were carried out face-to-face, recorded on tape, transcribed and verified by the respondents. For research phase 2, 24 interviews with 32 respondents from 18 German and Swiss companies were conducted. In addition, financial statements and internal company documents (e.g., organization charts, guidelines to calculate savings and sample calculations) were analyzed.

To analyze the 350 pages of transcripts and further documents, data reduction, data display and conclusion drawing / verification were conducted (cf. Miles & Huberman, 1994). For data reduction, a two-stage coding approach was applied to the transcripts and all the other data (Corbin & Strauss, 1990). After extracting the main codes from the original data, these codes were summarized to open codes. In the next step, the coded data were arrayed case by case and according to the relevant variables in a matrix (Miles & Huberman, 1994). Finally, the propositions formulated by Chenhall (2003) were tested on the basis of the data matrix.

3.2.3. Testing behavioral aspects

In research phase 3, two laboratory experiments are conducted to address RQ3. The basic question in this research phase is how intra-organizational control systems affect inter- and intra-organizational negotiations and final price in CEP.

Thereby, the following sub-RQs are answered:

- RQ3a: How does the applied savings calculation method in CEP influence the weighting of qualitative and monetary criteria in supplier selection, the negotiation success and the final price in CEP?
- RQ3b: What are the key success factors in CEP negotiations?
- RQ3c: What influence does negotiation success have in the evaluation of CEP projects?

In laboratory experiments, researchers observe human subjects who follow a set of instructions asking them to make decisions. After the experiment, the subjects receive a payoff, depending on the decisions they made (Hoffman & Spitzer, 1985). Experimental research has been playing an important role in managerial accounting for about 40 years (Maines et al., 2006) and is also gaining momentum in supply chain management lately (Eckerd & Bendoly, 2011). In behavioral management accounting, laboratory experiments are the predominant research method (Meyer & Rigsby, 2001). Laboratory experiments allow a significant degree of control and the ability to reproduce the findings (Croson, 2002).

Experiments should be conducted for studies on "whether and how managerial accounting practices affect the behavior of individuals within an organization" (Sprinkle & Williamson, 2006, p. 417) and the relevant dimensions of the decision making are well known (Birnberg, 2011). Both requirements are met because we analyze how the applied savings calculation method influences behavior in CEP and as a result of research phases 1 and 2 the relevant dimensions of this topic are well known. Furthermore, experimental research seems to be an appropriate method to analyze the RQ, because the subjects experience real outcomes depending on their responses and the questions are therefore not completely hypothetical (Croson, 2002).

Students are used as subjects in this experiment because they are unbiased and retain knowledge well. This is a common procedure in behavioral research in accounting (Meyer & Rigsby, 2001). Students are regarded as adequate substitutes for professionals for many decision-making experiments in the accounting context, because they allow a higher degree of control and lead to the same results (Liyanarachchi, 2007).

In order to analyze the influence of the applied savings calculation method in CEP, specific calculation methods are tested. The most common saving methods for CEP are the price quotation method – single initial offer (PQM-SIO) and the budget comparison method (BCM). The PQM-SIO compares the initial and the final offer price from the chosen supplier and the BCM calculates the difference between the planned CEP budget and the final offer price from the chosen supplier.[11]

The experiments are designed to test the following hypotheses, which are derived from a literature review and case study research:

- H1a: When applying PQM-SIO in CEP, more expensive offers and higher quality offers are selected, compared to BCM.
- H1b: When applying PQM-SIO in CEP, the purchaser's performance in supplier negotiations is higher compared to BCM.
- H2: Making the first offer in the negotiation has a positive influence on the outcome of negotiations in CEP.
- H3: When CEP projects with the same user value and same final price are being evaluated, the projects with a higher negotiation success are more positively evaluated.

Experiment 1 focuses on H1a, H1b and H2 and experiment 2 addresses H3. Experiment 1 employed a within subjects design (participants serve in several treatments) with two treatments. In treatment 1, the PQM-SIO was applied to measure savings. Treatment 2 used the BCM to calculate savings. In the experiment, the roles of purchasers, technicians and suppliers were distinguished. Purchasers were incentivized to buy a cheap excavator, technicians to select a high-quality excavator and suppliers tried to sell the excavator for the highest possible price. In the experimental task, purchasers and technicians first had to agree pairwise on one of several offers for an excavator. In the second step, purchasers and suppliers had to negotiate the final price for the selected offer.

In Experiment 2, a within subjects design with two treatments was also conducted. The experimental task was to evaluate eight completed CEP projects from the view of procurement based on the user value, the final price and negotiation success on a scale

[11] These findings are revealed in research phase 2 and are used for the design of the experiments in research phase 3.

from 0% to 100%. Thereby, two projects, which were not listed in sequence in the evaluation table, had the same user value and the same final price, but a different negotiation success. The payment for the participants depended on the deviation from the average evaluation done by professionals prior to the experiment.

Subsequent to the experiments, participants filled out a questionnaire concerning personal data (role in experiment 1, age, sex, subject, number of semesters), satisfaction with the savings calculation methods (only purchasers), self-evaluations (performance in experiment 1, ambition, needs for recognition, honor, power, vengeance and saving) and the number of rounds in which they made the first offer.

Both experiments were conducted in a row with the same subjects in the Laboratory for Experimental Research (LERN) at the University of Erlangen-Nuremberg (Germany) in the fall of 2012. In total, 114 students participated in each experiment. The experiments were conducted in five executions with 21-24 participants each. Experiment 1 lasted about 60 minutes, experiment 2 about ten minutes, the questionnaire five minutes and the payment of the participant about 15 minutes. The average performance-related payment was € 10.30 in experiment 1 and € 2.40 in experiment 2. In addition, each participant received a show-up payment of € 2.50. Therefore, the average hourly payment was € 10.13, which corresponds to an hourly payment for student assistants in Germany.

4. Key research findings

In the following sections, the key research findings of each of the three research phases are summarized. As each research phase is related to a specific paper, the results are presented according to the structure of the papers.

4.1. Paper A: Savings measurement for capital equipment purchasing: Challenges and conceptual model

In Paper A, the results begin with a description of how companies measure savings for CEP and which methods they use.[12] Although all three companies use a savings guideline, savings measurement for CEP differs in each case. In company A (manufacturer for the construction and building maintenance industry with total spend of € 0.8 bn.), the central procurement department is responsible for procurement performance measurement. Thereby, performance dimensions with measurable (e.g., savings) and non-measurable bottom line impact are distinguished. Typical savings are purchase price changes, discounts and payment term changes. Savings for CEP are normally measured as the absolute difference between the offer received after the technical coordination with the supplier and the final price without taking into account TCO. This price difference is divided by the specific depreciation period and reported as savings in the actual year.

Company B is a manufacturer of construction materials with total spend of € 11.9 bn. Procurement performance measurement is primarily conducted by the central procurement department and distinguishes between quantitative and qualitative measures. The results are summarized in a P-BSC, which encompasses 56 performance measures. Savings for CEP are defined as the difference between the initial offer price and final offer price for the selected capital equipment, whereby TCO are not considered in practice.

Procurement performance measurement in company C (manufacturer in the chemical industry with total spend of more than € 20 bn.) is located in a separate organizational unit. The main performance measures for company C are the organizational procurement costs and savings. Savings can only be reported if at least one of the

[12] Section 4.1 is based on the sections 3 and 4 of the paper in appendix A.

defined procurement strategies – for example, demand bundling or increased competition – is applied. The savings guideline exactly describes the savings calculation methods. Concerning savings measurement, different methods for each situation are given, such as price quotation method – single offer from an established supplier or TCO reductions.

The identified challenges for companies with savings measurement for CEP can be categorized as procedure-specific challenges (PsCs) and behavior-specific challenges (BsCs) (Table 3). PsCs primarily concern components and calculation methods in savings measurement for CEP. BsCs in savings measurement for CEP are associated with the behavior of the involved persons, such as purchasers and superiors. Many of the identified challenges have already been discussed in the literature; however, without special reference to savings measurement for CEP.

Table 3: Procedure- and behavior-specific challenges with savings measurement for capital equipment purchasing (Maucher & Hofmann, 2013)

Procedure-specific challenges		Behavior-specific challenges	
PsC1	Definition of the correct reference price (cases B, C).	BsC1	Sometimes purchasers violate savings guidelines (case C).
PsC2	The TCO of capital equipment are rarely included in the calculation (cases A, B).	BsC2	Purchasers only book savings into the system until they have reached their yearly targets (case C).
PsC3	The benefit of capital equipment is usually not considered (case A).	BsC3	Often, only positive savings are reported (case C).
PsC4	The pure involvement of costs in savings measurement disregards critical qualitative aspects of CEP (e.g., time, quality, interdependences) (case B).	BsC4	In some cases, the superior conducts the control, even though his / her bonus also depends on the savings measurement (case C).
PsC5	Price changes after placing an order are often not considered for savings measurement (case C).	BsC5	Savings that are reported to management are often not trusted very much (cases A, B).
PsC6	If considerably fewer orders are placed, savings targets cannot be reached (case C).	BsC6	Often the savings-measurement process is perceived as a tedious task (case C).
		BsC7	If several performance dimensions are reported, a holistic evaluation of the procurement performance depends on individual judgment (case A).

Based on the case findings and a literature review, IPs are formulated and a conceptual model is developed (Figure 9). The model states that internal and external factors influence the concept and manipulation in savings measurement for CEP (IP1, IP2, IP3). The concept in turn affects manipulation (IP4) and management trust and judgment (IP5). Management trust and judgment, which is also influenced by manipulation (IP6), has together with the savings measurement concept an effect on

CEP performance (IP7, IP8). Based on the model, it can be stated that CEP performance depends on the fit between the savings measurement concept and the contextual variables and an appropriate concept can contribute to reducing manipulation and raising management trust in savings measurement for CEP.

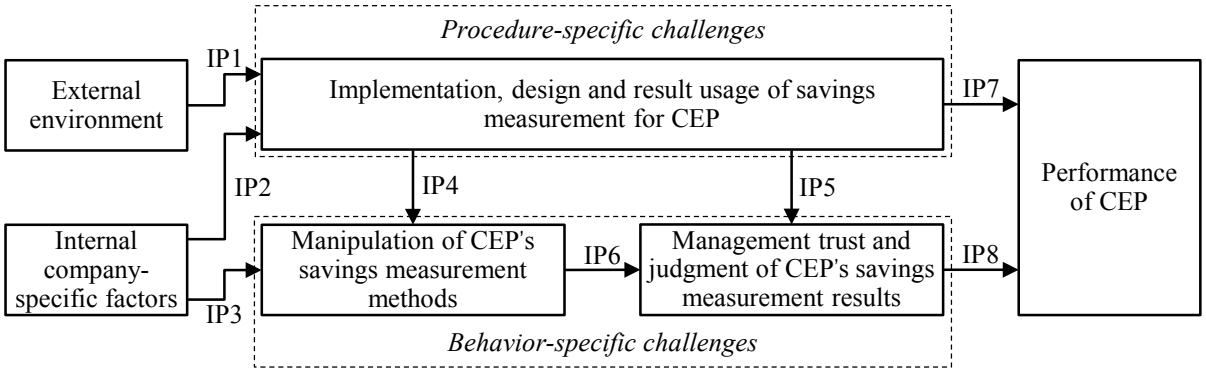

Figure 9: Preliminary conceptual model (Maucher & Hofmann, 2013)

4.2. Paper B: Contingency-based analysis of management control systems: The case of performance and savings measurement for capital equipment purchasing

In Paper B, the case study findings on performance and savings measurement for CEP are compared with the propositions concerning MCS formulated by Chenhall (2003).[13] In the following, the results for one proposition are discussed exemplary based on proposition 3. Subsequently, the results of the whole analysis will be summarized.

Proposition 3 concerning the external environment states: "Where MCS focused on tight financial controls are used in uncertain external environments they will be used together with an emphasis on flexible, interpersonal interactions" (Chenhall, 2003, p. 138).

Financial performance measures and dimensions in procurement involve, for example, savings as well as cost avoidance, the costs of the procurement organization and the purchasing volume awarded through tenders. Common non-financial performance measures are the quality and availability of goods and services, supplier performance, competition ratio and framework agreement usage. In our study, case companies with an above-average application of financial procurement performance measures are

[13] Section 4.2 is based on sections 4.1 and 5 of the paper in appendix B.

assumed to be “focused on tight financial controls”. Environmental uncertainty was measured by the frequency and altitude of negative sales developments on the industry level. Based on this conceptualization, six companies are classified as operating in an uncertain external environment and focusing on tight financial measures.

“An emphasis on flexible and interpersonal interactions” in purchasing performance and savings measurement for CEP can be conceptionalized by means of applying participative budgeting (functional company functions are involved in the determination of budgets), non-application of a savings guideline and the occurrence of manipulation. The results of our study show that participative budgeting is applied more often in financially focused companies with an uncertain environment. Furthermore, the six selected companies predominantly do not use formal savings guidelines in contrast to the remaining companies. However, concerning manipulation our results show the opposite of the analyzed proposition. Manipulation is a challenge for the remaining companies rather than for the financially focused companies in an uncertain environment. As a summary concerning proposition 3, it can be stated that the study results mostly support the proposition.

The summary of the comparison of the research findings with Chenhall’s (2003) propositions shows that a majority of the 22 analyzed propositions were confirmed (Table 4). The results give a hint that MCS contingent factors also play an important role for the case of performance and savings measurement for CEP. However, since a significant number of propositions are completely or mostly not confirmed, the findings indicate that performance and savings measurement for CEP is not a typical case of MCS. Furthermore, the results show differences concerning the analyzed contingent areas. The contingent areas “size and MCS” as well as “culture and MCS” are the only areas that are completely confirmed.

These findings indicate that the validity of the propositions in the contingent areas differs. Size and culture seem to have a much strong influence on MCS than organizational structure and strategy.

Table 4: Summary of the comparison of the research findings with Chenhall's (2003) propositions

Area	Confirmed	Mostly confirmed	Partially confirmed	Mostly not confirmed	Not confirmed
External environment and MCS		1	1		1
Generic concepts of technology and MCS	2		1		
Advanced technologies and MCS	1				1
Organizational structure and MCS	2		1		3
Size and MCS	3				
Strategy and MCS	1			3	
Culture and MCS	1				
Total	10	1	3	3	5

In addition to contingencies, the applied CEP savings calculation methods in the case companies have been analyzed based on the applied savings guidelines. If previous paid prices and catalog prices cannot be used, savings for CEP are calculated as the difference between:

- the initial and the final offer price from the chosen supplier (PQM-SIO);
- the offer price after the first technical discussion and the final price from the chosen supplier (price quotation method – single technically validated offer);
- the average price of the *n* (e.g., three) cheapest offers meeting the requirements and the final price (price quotation method – average offer);
- the lowest final offer price of a new supplier and the lowest final offer price of an established supplier (price quotation method – single offer from an established supplier);
- the planned CEP budget and the final offer price from the chosen supplier (BCM);
- the calculated value and the final price (value analysis approach). To calculate the value of capital equipment, either a cost analysis can be conducted or reference prices for each major component can be determined. Reference prices can be based on historical prices, adapted historical prices or estimations.

The different forms of the price quotation method and the BCM are applied by most companies. TCO were only partially integrated in a few companies.

In order to be able to calculate savings at different implementation statuses ("hardness degrees"), some companies apply the hardness degree system (Entchelmeier, 2008). Thereby, the realization probability of the savings increases the later the savings are calculated. Table 5 shows an example of a hardness degree system.

Table 5: Hardness degree system for measuring savings in purchasing (cf. Hofmann et al., 2012b)

Hardness Degree	Definition	Results
1	Measure identified	Optimization need identified, overriding objective defined
2	Measure evaluated	Potential quantified (quick check, potential analysis)
3	Measure prepared	Procedure, time schedule and persons responsible specified; volume confirmation finalized; strategic request made (including offers returned)
4a	Measure prior to negotiation	Evaluation of offers returned; award scenarios prepared
4b	Measure in final negotiation	Negotiations with selected potential suppliers; award scenarios prepared
4c	Measure prior to implementation	Auditing or sampling performed; release provided
5	Implementation of measure begun	Contract signed; phasing in of new supplier portfolio begun; first impact on results traceable
6	Measure fully implemented	Measures fully implemented; impact on results traceable on the basis of 12 months

4.3. Paper C: Effects of intra-organizational control systems on inter- and intra-organizational negotiations: The case of capital equipment purchasing

In Paper C, two laboratory experiments are conducted to test behavioral aspects in savings measurement and negotiations for CEP.[14]

First, experiment 1 reveals that when applying PQM-SIO, those offers with a 4.3% higher initial offer price compared to BCM were selected, which is statistically significant and supports H1a. The average price discount was 3.4% for the case of PQM-SIO compared to 3.2% when applying BCM. H1b is not supported because the

[14] Section 4.3 is based on section 4 of the paper in appendix C.

difference between the discounts is not statistically significant. Furthermore, the results show that the average final price in PQM-SIO is significantly higher (4.0%) than in BCM. Concerning negotiations in CEP, the results reveal that participants with an above-average negotiation success within their control group (purchaser, supplier and technician) made significantly more first offers (3.5) than participants with a below-average negotiation success (2.9). Therefore, it can be stated that making the first offer in a CEP negotiation has a positive influence on the outcome of the negotiation, supporting H2.

In experiment 2, the effect of the negotiation success when evaluating CEP projects, with the same user value and same final price is analyzed. The results show that 81% of the participants evaluated the project with the higher negotiation success more positively than the project with the lower negotiation success. Although, the negotiation success should not be considered in this situation from a logical point of view, the project with the higher negotiation success was evaluated on average 11.8 percentage points more positively, supporting H3.

In addition to the tested hypotheses, further analyses were conducted. First, the results show that the student's number of semesters, their ambition and the need for power have a significantly positive effect on success in CEP negotiation. Second, the results of experiment 1 show that purchasers (average negotiation success 33.9%) perform significantly worse than suppliers (65.0%) and technicians (66.3%). Third, the participant's role in experiment 1 influenced the evaluation difference between the two projects with the same user value and same final price in experiment 2. The evaluation difference amounts to 6.6% in the technicians' group compared to 13.0% for purchasers and 15.8% for suppliers, which is significantly different. Fourth, the results show that participants put most emphasis on the user value and the final price-user value-quotient when evaluating the projects. Thereby, technicians put significantly more emphasis on the user value than purchasers and suppliers.

5. Conclusion

In the final section, the theoretical and managerial implications of the research results are presented. Furthermore, limitations of the research are discussed and possibilities for future research are revealed.

5.1. Theoretical implications

In the following, the theoretical implications from the three research phases are summarized.

In research phase 1, three cases from the manufacturing industry describe how companies measure savings for CEP.[15] Concerning the challenge of missing reference prices in CEP, different appropriate savings calculation methods are presented that also show how TCO can be considered. Furthermore, PsCs and BsCs in practical savings measurement for CEP are presented and discussed. PsCs concern methodological issues and BsCs are associated with the unintended behavior of the involved actors in savings measurement for CEP. The discussion involves the challenge of manipulation in savings measurement for CEP and presents several countermeasures.

Based on a literature review and the case study results, a preliminary conceptual model concerning savings measurement for CEP is developed. According to the propositions in the preliminary conceptual model, savings measurement for CEP is influenced by company-internal and company-external contextual factors and itself affects behavior-specific aspects in savings measurement for CEP (e.g., manipulation, trust and judgment) as well as performance of CEP.

In research phase 2, case studies are applied to analyze the influence of contingent factors on savings measurement for CEP.[16] For this purpose, the propositions formulated by Chenhall (2003) on MCS in general are tested for the case of savings measurement for CEP. Thereby, a majority of the propositions are confirmed. These findings emphasize the importance of MCS contingent factors concerning performance

[15] This paragraph is based on section 5 of the paper in appendix A.

[16] This paragraph is based on section 5 of the paper in appendix B.

and savings measurement for CEP and support the propositions on the determinants of savings measurement for CEP from research phase 1. The unconfirmed propositions indicate that purchasing and savings measurement for CEP has special characteristics and cannot be regarded as a typical example of MCS. These propositions were reformulated and adapted for the case of purchasing and savings measurement for CEP. Furthermore, the results revealed differences concerning proposition support for the analyzed contingent areas. For example, "size and MCS" as well as "culture and MCS" are the only completely confirmed contingent areas, whereas "strategy and MCS" is mostly not confirmed. These findings point to the validity of the general proposition for the different contingent areas. While the propositions on size and culture seem to be true for many MCS cases, propositions on strategy seem to be less valid. Finally, the hardness degree system is presented for the calculation of savings at different points in time.

In research phase 3, two laboratory experiments are conducted to analyze behavioral aspects concerning savings measurement as well as negotiations for CEP and evaluation of CEP projects.[17] The results show that company-internal performance measurement has an influence on inter- and intra-organizational negotiations. However, in experiment 1 the participants did not behave completely in a rational manner. In the PQM-SIO treatment, it would have been optimal under an effort-benefit-aspect for purchasers to agree on offer number 8.5 on average to meet their given budget. For technicians, it would have been optimal to agree on offer number 10. Therefore, the theoretical equilibrium is offer number 9.25. However, in the PQM-SIO treatment, offer number 7.4 was selected on average. The difference between the theoretical equilibrium and the experimental results indicates that purchasers are willing to invest more effort in a negotiation although this does not necessarily lead to a higher personal benefit. However, if a higher effort leads to a higher personal benefit, purchasers attained even better results in the negotiation. Furthermore, the purchaser's success in supplier negotiations is only slightly better in the PQM-SIO treatment compared to BCM, even though the focus in the PQM-SIO treatment should be on the negotiation with the supplier. Therefore, incentivizing of purchasers in CEP with multiple goals seems to have only minimal impact on the negotiation success. Due to the minor impact of price discount, the final price in CEP is higher when

[17] The theoretical implications of research phase 3 are based on section 5 of the paper in appendix C.

applying PQM-SIO compared to BCM. Additionally, the results of experiment 1 reveal that the general positive effect of making the first offer in negotiations is also true for the special case of CEP. Table 6 shows the theoretical equilibriums and experimental results for both treatments in experiment 1.

Table 6: Theoretical equilibriums and experimental results in experiment 1

	Treatment 1 (PQM-SIO)		Treatment 2 (BCM)	
	Theoretical equilibriums	**Experimental results**	**Theoretical equilibriums**	**Experimental results**
Step 1: offer selection	= (8.5+10) / 2 = 9.25	7,4	= (1+10) / 2 = 5.5	6.5
Step 2: price negotiation	approx. 5% discount	3.4%	approx. 5% discount	3.2%

Experiment 2 addresses the described challenge of aggregating CEP performance results. The results show that CEP projects with the same benefit and the same price are evaluated differently depending on the negotiation success, although theoretically negotiation success should not be taken into account in this situation, because the CEP performance is determined only by price and user value. In order to obtain a higher negotiation success in CEP, purchasers just have to request the favored suppliers for a higher initial offer.

The supplemental analysis revealed that the participant's number of semesters positively affects the CEP negotiation success, independently of the participant's subject. Ambition and the need for power are also positively correlated with the negotiation success in CEP. Additionally, our findings demonstrate that purchasers perform much worse in CEP negotiations than suppliers and technicians. A possible reason for this phenomenon could be the double burden of two negotiations for purchasers. The average discount in the experiment amounts to about 3% in both treatments, although 5% is the theoretical equilibrium. A discount of 3% is usual in many practical examples and therefore might have served as an anchor in the experiment. Furthermore, the results revealed that the evaluation difference between the two projects with the same user value and the same final price is much lower for technicians compared to purchasers and suppliers. Finally, concerning the project evaluation, it can be stated that participants weight the user value and the final price-user value-quotient most, with technicians putting a higher priority on the user value

than purchasers and suppliers. This leads to the assumption that evaluators of CEP projects put more emphasis on those criteria that are important in their own work.

5.2. Managerial implications

In addition to the theoretical implications, the results of the dissertation provide several managerial implications. These implications are described according to procedure-specific aspects, contingency-based design as well as behavioral aspects of performance and savings measurement for CEP, CEP negotiations and the evaluation of CEP projects.

Concerning procedure-specific aspects, the findings offer recommendations to improve objectivity, accuracy and constancy in savings measurement for CEP:[18]

- A CEP savings standard should be derived from CEP strategy: Beginning with the company strategy, procurement and CEP strategy need to be defined. The CEP strategy forms the basis of the savings standard and individual goals.
- Savings should be integrated into a holistic CEP performance measurement with multiple measures, especially if they are influenced by exogenous uncertainty and might be subject to manipulation: Hence, for each project several performance measures – such as savings, delivery time, quality and safety – should be gathered and displayed. These project-specific measures can be supplemented by measures focusing on the organization.
- TCO and monetary benefits should be considered in the CEP savings calculation: This information is often available for profitability calculations and should be integrated into the savings calculation for the lifetime of the capital equipment.
- Savings should be calculated at different implementation statuses in CEP according to the hardness degree system: Possible implementation statuses are: measure identified, measure evaluated, measure prepared, measure prior to negotiation, measure in final negotiation, measure prior to implementation, implementation of measure begun and measure fully implemented.

[18] Managerial implications concerning procedure-specific aspects are based on section 5 in appendix A and section 5 in appendix B.

- Savings guidelines that clearly describe calculation methods for specific CEP situations should be established: This can be implemented by means of a decision tree that identifies the appropriate calculation method based on several criteria. The savings guideline for CEP should be integrated into a comprehensive savings guideline for all commodity groups.
- CEP savings results should be audited by independent parties: The independent auditors should not rely on the savings results and could be, for example, accounting employees.
- CEP savings targets should be specified realistically as a function of actually achieved purchasing spend: Hence, the purchasing spend has to be determined for the period of the savings targets.
- If historical prices for capital equipment are not available, attempts should be made to gather historical prices for the capital equipment components: The savings calculation can be conducted with the value analysis approach.
- Budgetary slack in CEP projects can be reduced by applying top-down and bottom-up budgeting in combination: First, a top-down approach is applied and this is then followed by bottom-up budgeting that allows the involved parties to reach a consensus.

Furthermore, the results provide managerial implications for the contingency-based design of performance and savings measurement for CEP:[19]

- Companies in an uncertain environment should expand their performance and savings measurement for CEP as a consequence of higher material ratios: This can be achieved through the involvement of more performance measures and a larger number of commodity groups.
- Companies should be aware that participative budgeting, which is especially conducted in an uncertain environment, can lead to riskier (lower) budgets: Especially for participative budgeting, the definition of too low budgets should be prevented through realistic calculations.
- If CEP processes have a low degree of standardization, companies should use both financial as well as non-financial measures and should be aware of manipulation in performance and savings measurement for CEP: Possible ways

[19] Managerial implications concerning the contingency-based design are based on section 5 in appendix B.

to reduce manipulation are, for example, a holistic performance measurement and realistic targets.

- Especially smaller companies should establish performance-linked payment in CEP, because in these companies CEP outcomes are more closely related to individual performance: Therefore, the existing fixed payment should be reduced and supplemented with a variable payment. The connection to incentive systems should be closer the lower the purchaser's risk aversion, the higher the measure's accuracy and the fewer the manipulation possibilities of the measure (cf. Pfaff & Pfeiffer, 2001).
- In supplier partnership practices for CEP, financial as well as non-financial measures should be used together with personal interactions: Thereby, not only should supplier-focused measures be used, but also measures that evaluate the buyer-supplier-relationship.
- Performance and savings measurement for CEP should be adapted to the size, strategy and culture of the company: For example, smaller companies should focus on basic but reliable measures.

The managerial implications of the analysis concerning behavioral aspects in savings measurement for CEP are:[20]

- The effects of the applied savings calculation method on purchaser's behavior should be taken into account for the design of savings guidelines: If the quality of the capital equipment is foremost, PQM-SIO should be applied and for cost-critical projects BCM should be selected.
- The greatest leverage in CEP to obtain savings lies in the offer selection process and not in price negotiations with the supplier: As a consequence, the focus in CEP should be on the specification of requirements and the definition of decision criteria for the offer selection.

[20] Managerial implications concerning behavioral aspects are based on section 5 in appendix C.

The results of the dissertation also lead to practical recommendations for CEP negotiations:[21]

- Company-internal and company-external CEP negotiations should be conducted separately: One possibility is to deploy different purchasers for each negotiation.
- Purchasers should be aware of anchors (e.g. 3%-discount) in CEP negotiations and always try to obtain the highest possible discount: The impact of anchors can be reduced through cognitive abilities training.
- Purchasers should, whenever possible, make the first offer in final price negotiations with the supplier in CEP: Purchasers should be trained in this procedure.
- Especially ambitious individuals with a strong need for power should be selected for CEP negotiations: This attitude can, for example, be asked about in job interviews.

Finally, the findings imply managerial implications for the evaluation of CEP projects:[22]

- Evaluations should be performed by independent parties: This can, for example, be accounting employees.
- In the evaluation of CEP projects, superiors should be aware of the minimal validity of the negotiation success measure: Superiors should be trained concerning this problem.
- Evaluators of CEP projects should try to objectively weight performance measures and not place more weight on criteria that are important in their own work: Hence, the evaluator's attention should be drawn to this phenomenon.

5.3. Limitations and future research

Like all research, this dissertation is subject to limitations. In the following, content-related limitations in general and the methodological limitations of each research phase are discussed.

[21] Managerial implications concerning CEP negotiations are based on section 5 in appendix C.

[22] Managerial implications concerning evaluation of CEP projects are based on section 5 in appendix C.

Savings measurement is an important part in procurement performance measurement for CEP, but it is only one part. Furthermore, value-based performance measurement, which considers not only profit but also the cost of capital, has become more important in procurement (e.g., Dumond, 1994). Although the role of TCO in savings measurement is discussed in detail, the value-based aspect was not explicitly analyzed in this dissertation. The dissertation examines important aspects within savings measurement for CEP and closely related topics. However, this dissertation does not claim to involve all possible aspects within and related to savings measurement for CEP in detail. Examples of further topics concerning savings measurement for CEP are the implementation process, setup of a database for the value analysis approach, integration into IT and incentive systems, consideration of leasing and performance contracting, etc. Eventually, the dissertation gives several recommendations for the design, organization and calculation of savings measurement for CEP. However, it does not provide a best-practice calculation method or a specific guideline for a situation-specific method application. Therefore, some of the described challenges in savings measurement for CEP (section 2.1.6) have not been addressed. These challenges are the allocation of savings to several employees, evaluation of whether the highest possible savings are actually realized and the consideration of the economic situation as well as interdependences.

In research phase 1, a descriptive case study with three cases from the manufacturing industry is conducted. With the small number of cases, this analysis is, of course, not even representative for the manufacturing industry, apart from other industries. Also the functions of the interviewees within the companies are not completely representative and might have affected the findings. Furthermore, the analyzed literature, the identified challenges and the conceptual model are not conclusive.

In research phase 2, a case study with 18 companies and 32 interviewees is conducted. Although, in comparison to research phase 2 a larger number of companies are involved, the results are still not statistically significant. As a consequence of the applied data reduction, the level of detail decreased. Furthermore, the classification of each company according to the analyzed criteria and the selection of the tested measures are not completely objective. Finally, the reasons for the discovered relationships have not been analyzed in detail.

The limitations in research phase 3 primarily concern the experimental design and procedures (e.g., participants, experimental task, treatments, payment) that might have influenced the findings. For example, it could be that professional purchasers might have behaved differently than the involved students and order effects may have occurred as a consequence of the within subjects design. Similar to research phase 2, reasons for the statistical relationships have not been examined. Finally, as in every laboratory experiment, the reality is much more complex than the experimental design. CEP in corporate practice differs, for example, by means of the number of people involved, the process, the selection criteria and the time period.

As the present dissertation is the first explicit analysis on savings measurement for CEP, there are still many topics within this field for further research. Also the described limitations of this dissertation provide opportunities for further research. Further research on this topic can be distinguished into content and methodological aspects.

Further research concerning content aspects can, for example, address the following:

- One or more best-practice methods for savings measurement for CEP should be developed. Thereby, the implications of this dissertation should be considered. Future approaches could be based on the BCM. The challenge associated with this method is the appropriate definition of the budget size. A possibility could be the combination of top-down and bottom-up budgeting in order to attain a higher objectivity.
- Unsolved challenges in savings measurement for CEP, such as the consideration of the economic situation and interdependences, should be approached.
- The implementation process of savings measurement for CEP should be analyzed.
- The CEP savings calculation methods should be integrated into a situation-specific savings guideline.
- The interaction and integration of savings measurement with procurement performance measurement and incentive systems should be further examined.
- Savings measurement should be examined in detail for other goods or services.

Examples for further research concerning methodological aspects of this dissertation are as follows:

- The findings of this dissertation should be tested in a survey with a large sample size to obtain statistical significance.
- The reasons for the described relationships and behaviors should be analyzed in detail, for example, with surveys or further experiments.
- In order to raise the validity and closeness to reality of the findings in research phase 3, the experiment should be repeated with a varied design and procedure (e.g., using procurement professionals as subjects, changing the treatment order, conduct of several negotiation rounds or group negotiations).
- Other laboratory experiments should be conducted to analyze manipulation in savings measurement for CEP.

This selection shows that even though savings measurement for CEP is a specific topic within procurement performance measurement, the research field still offers plenty of opportunities for further research.

References

Adams, J. S. (1963). Towards an Understanding of Inequity. The Journal of Abnormal and Social Psychology, 67(5), 422-436.

Akerlof, G. A. (1970). The Market for "Lemons": Quality Uncertainty and the Market Mechanism. The Quarterly Journal of Economics, 84(3), 488-500.

Alderfer, C. P. (1969). An Empirical Test of a New Theory of Human Needs. Organizational Behavior and Human Performance, 4(2), 142-175.

Alderfer, C. P. (1972). Existence, Relatedness, and Growth: Human Needs in Organizational Settings. New York: Free Press.

Alparslan, A. (2006). Strukturalistische Prinzipal-Agent-Theorie: Eine Reformulierung der Hidden-Action-Modelle aus der Perspektive des Strukturalismus. Wiesbaden: Deutscher Universitäts-Verlag.

Altmann, S., Falk, A. & Marklein, F. (2009). Eingeschränkt rationales Verhalten: Evidenz und wirtschaftspolitische Implikationen. Bonn: Forschungsinstitut zur Zukunft der Arbeit.

Anderson, P. & Chambers, T. (1985). A Reward/Measurement Model of Organizational Buying Behavior. Journal of Marketing, 49(2), 7-23.

Arnold, U. (1990). Global Sourcing: Ein Konzept zur Neuorientierung des Supply Management von Unternehmen. In: M. K. Welge (Ed.), Globales Management: Erfolgreiche Strategien für den Weltmarkt (49-71). Stuttgart: Poeschel.

Arnold, U. (1997). Beschaffungsmanagement (2nd ed.). Stuttgart: Schäffer-Poeschel.

Arnold, U., Eßig, M., Kummer, S., Stölzle, W. & Weber, J. (2005). Supply (Chain) Controlling zwischen Rückstand und Fortschritt: Thesen zum Entwicklungsstand einer dynamischen Disziplin. Controlling, 17(1), 41-48.

Arnold, U. & Warzog, F. (2006). Beschaffungscontrolling. In: U. Arnold & G. Kasulke (Eds.), Praxishandbuch innovative Beschaffung: Wegweiser für den strategischen und operativen Einkauf (309-336). Weinheim: Wiley VCH Verlag GmbH.

Arnolds, H., Heege, F., Röh, C. & Tussing, W. (2012). Materialwirtschaft und Einkauf: Grundlagen - Spezialthemen - Übungen. Berlin, Heidelberg, New York: Springer.

Arrow, K. J. (1984). The Economics of Agency. Stanford, CA: Institute for Mathematical Studies in the Social Sciences, Stanford University.

Ashenbaum, B. (2006). Defining Cost Reduction and Cost Avoidance. Tempe, AZ: Center for Advanced Purchasing Studies.

Ashton, R. H. (1990). Pressure and Performance in Accounting Decision Settings: Paradoxical Effects of Incentives, Feedback, and Justification. Journal of Accounting Research, 28(3), 148-180.

Awashti, V. & Pratt, J. (1990). The Effects of Monetary Incentives on Effort and Decision Performance: The Role of Cognitive Characteristics. The Accounting Review, 65(4), 797-811.

Axelsson, B., Laage-Hellman, J. & Nilsson, U. (2002). Modern Management Accounting for Modern Purchasing. European Journal of Purchasing & Supply Management, 8(1), 53-62.

Backhaus, K. (1982). Investitionsgüter-Marketing. München: Vahlen.

Baiman, S. (1990). Agency Research in Managerial Accounting: A Second Look. Accounting, Organizations and Society, 15(4), 341-371.

Bamber, E. M. (1993). Opportunities in Behavioral Accounting Research. Behavioral Research in Accounting, 5, 1-29.

Banker, R. D., Chang, H. & Pizzini, M. J. (2004). The Balanced Scorecard: Judgmental Effects of Performance Measures Linked to Strategy. The Accounting Review, 79(1), 1-23.

Banting, P., Beracs, J. & Gross, A. (1991). The Industrial Buying Process in Capitalist and Socialist Countries. Industrial Marketing Management, 20(2), 105-113.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99.

Baumgarten, H. & Darkow, I.-L. (2003). Controlling für die Versorgung. In: R. Boutellier, S. M. Wagner & H. P. Wehli (Eds.), Handbuch Beschaffung. Strategien – Methoden – Umsetzung (365-388). München: Carl Hanser Verlag.

Becker, S. W. (1967). Discussion of the Effect of Frequency of Feedback on Attitudes and Performance. Journal of Accounting Research, 5, 225-228.

Beidelman, K. (1987). Purchasing and Profit: Contributions worth Measuring. Journal of Purchasing & Materials Management, 23(3), 2-9.

Birnberg, J. G. (2011). A Proposed Framework for Behavioral Accounting Research. Behavioral Research in Accounting, 23(1), 1-43.

Birnberg, J. G., Turopolec, L. & Young, S. M. (1983). The Organizational Context of Accounting. Accounting, Organizations and Society, 8(2/3), 111-129.

Boddy, D., Macbeth, D. & Wagner, B. (2000). Implementing Collaboration between Organizations: An Empirical Study of Supply Chain Partnering. Journal of Management Studies, 37(7), 1003-1018.

Bonner, S. E. & Sprinkle, G. B. (2002). The Effects of Monetary Incentives on Effort and Task Performance: Theories, Evidence, and a Framework for Research. Accounting, Organizations and Society, 27(4-5), 303-345.

Boutellier, R. & Locker, A. M. (1998). Beschaffungslogistik: Mit praxiserprobten Konzepten zum Erfolg. München, Wien: Hanser.

Bruns, W. J. & Coster, D. T. D. (1969). Accounting and Its Behavioral Implications. New York, NY: McGraw-Hill.

Buck, T. (1998). Konzeption einer integrierten Beschaffungskontrolle. Wiesbaden: Dt. Univ.-Verl.

Bunge, M. (1998). Philosophy of Science: From Problem to Theory. New Brunswick, NJ: Transaction Pub.

Burt, D. N., Dobler, D. W. & Starling, S. L. (2003). World Class Supply Management: The Key to Supply Chain Management (7th ed.). New York, NY: McGraw-Hill College.

Cai, S., Jun, M. & Yang, Z. (2006). The Impact of Interorganizational Internet Communication on Purchasing Performance: A Study of Chinese Manufacturing Firms. Journal of Supply Chain Management, 42(3), 16-29.

Caplan, E. H. (1971). Management Accounting and Behavioral Science. Reading, MA: Addison-Wesley Pub. Co.

CAPS Research (2005). Benchmarking Report Narrative Summary. Focus on ... Capital Spend 2004. Tempe, AZ: Center for Advanced Purchasing Studies.

CAPS Research (2011). Reporting Cost Savings. Tempe, AZ: Center for Advanced Purchasing Studies.

Carr, A. S. & Smeltzer, L. R. (1999). The Relationship among Purchasing Benchmarking, Strategic Purchasing, Firm Performance, and Firm Size. Journal of Supply Chain Management, 35(4), 51-60.

Carter, C. R. & Hendrick, T. E. (1997). The Development of a Time-Based Construct and Its Impact on Departmental Design and Structure. Journal of Supply Chain Management, 33(4), 26-34.

Cavinato, J. L. (1987). Purchasing Performance: What Makes the Magic? Journal of Purchasing & Materials Management, 23(3), 10-16.

Cavinato, J. L. (1992). Evolving Procurement Organizations: Logistics Implications. Journal of Business Logistics, 13(1), 27-45.

Chao, C.-n., Scheuing, E. E. & Ruch, W. A. (1993). Purchasing Performance Evaluation: An Investigation of Different Perspectives. International Journal of Purchasing & Materials Management, 29(3), 33-39.

Chenhall, R. H. (2003). Management Control Systems Design within its Organizational Context: Findings from Contingency-Based Research and Directions for the Future. Accounting, Organizations and Society, 28(2-3), 127-168.

Chmielewicz, K. (1979). Forschungskonzeptionen der Wirtschaftswissenschaft. Stuttgart: Poeschel.

Cooper, R. & Kaplan, R. S. (1991). Profit Priorities from Activity-Based Costing. Harvard Business Review, 69(3), 130-135.

Corbin, J. M. & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons, and Evaluative Criteria. Qualitative Sociology, 13(1), 3-21.

Covaleski, M. A., Dirsmith, M. W. & Samuel, S. (1996). Managerial Accounting Research: The Contributions of Organizational and Sociological Theories. Journal of Management Accounting Research, 8, 1-35.

Coyle, J. J., Novack, R. A., Gibson, B. & Bardi (2010). Transportation: A Supply Chain Perspective. Cincinnati, OH: Cengage South-Western.

Croson, R. (2002). Why and How to Experiment: Methodologies from Experimental Economics. University of Illinois Law Review, 921-945.

Csikszentmihalyi, M. (2009). Flow. New York: HarperCollins.

Das, A. & Narasimhan, R. (2000). Purchasing Competence and Its Relationship with Manufacturing Performance. Journal of Supply Chain Management, 36(2), 17-28.

Dawes, P. L., Dowling, G. R. & Patterson, P. G. (1992). Factors Affecting the Structure of Buying Centers for the Purchase of Professional Business Advisory Services. International Journal of Research in Marketing, 9(3), 269-279.

Daxböck, C., Nadilo, T., Henne, F., Reinisch, M., Schlünsen, H. & Ursel, S. (2011). Performance Management im Einkauf 2011: Den Wertbeitrag des Einkaufs aktiv steuern und optimieren. Stuttgart: Horváth & Partner.

Deci, E. L. & Ryan, R. M. (1993). Die Selbstbestimmungstheorie der Motivation und ihre Bedeutung für die Pädagogik. Zeitschrift für Pädagogik, 39(2), 223-238.

Dent, J. F. (1990). Strategy, Organization and Control: Some Possibilities for Accounting Research. Accounting, Organizations and Society, 15(1-2), 3-25.

Dilla, W. N. & Steinbart, P. J. (2005). Relative Weighting of Common and Unique Balanced Scorecard Measures by Knowledgeable Decision Makers. Behavioral Research in Accounting, 17(1), 43-53.

Discenza, R. & Gurney, B. (1990). New Considerations for Evaluating Capital Equipment Purchases. Production & Inventory Management Journal, 31(2), 33-37.

Dmytrenko, A. L. (1997). Cost Benefit Analysis. Records Management Quarterly, 31(1), 16-20.

Dobler, D. W., Burt, D. N. & Lee, L. (1990). Purchasing and Materials Management: Text and Cases (5th ed.). New York, NY: McGraw-Hill College.

Donaldson, L. (2001). The Contingency Theory of Organizations. London: Sage Publications.

Driedonks, B. A., Gevers, J. M. P. & van Weele, A. J. (2010). Managing Sourcing Team Effectiveness: The Need for a Team Perspective in Purchasing Organizations. Journal of Purchasing & Supply Management, 16(2), 109-117.

Drumm, J. (2005). Personalwirtschaft. Berlin, Heidelberg, New York: Springer.

Dul, J. & Hak, T. (2007). Case Study Methodology in Business Research. Burlington, MA: Oxford Butterworth-Heinemann.

Dumond, E. J. (1994). Moving Toward Value-Based Purchasing. International Journal of Purchasing & Materials Management, 30(2), 2-8.

Dunk, A. S. (1992). Reliance on Budgetary Control, Manufacturing Process Automation and Production Subunit Performance: A Research Note. Accounting, Organizations and Society, 17(3/4), 195-203.

Easton, L., Murphy, D. J. & Pearson, J. N. (2002). Purchasing Performance Evaluation: With Data Envelopment Analysis. European Journal of Purchasing & Supply Management, 8(3), 123-134.

Eckerd, S. & Bendoly, E. (2011). Introduction to the Discussion Forum on Using Experiments in Supply Chain Management Research. Journal of Supply Chain Management, 47(3), 3-4.

Eichhorn, W. (1979). Die Begriffe Modell und Theorie in der Wirtschaftswissenschaft. In: H. Raffée & B. Abel (Eds.), Wissenschaftstheoretische Grundlagen der Wirtschaftswissenschaften (60-104). München: Vahlen.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. Academy of Management Review, 14(4), 532-550.

El-Ansary, A. I. & Stern, L. W. (1972). Power Measurement in the Distribution Channel. Journal of Marketing Research, 9(1), 47-52.

Ellram, L. M. (1995). Total Cost of Ownership: An Analysis Approach for Purchasing. International Journal of Physical Distribution & Logistics Management, 25(8), 4-23.

Ellram, L. M. & Pearson, J. N. (1993). The Role of the Purchasing Function: Toward Team Participation. International Journal of Purchasing & Materials Management, 29(3), 2-9.

Emiliani, M. L., Stec, D. J. & Grasso, L. P. (2005). Unintended Responses to a Traditional Purchasing Performance Metric. Supply Chain Management, 10(3), 150-156.

Englyst, L., Jørgensen, F., Johansen, J. & Mikkelsen, O. S. (2008). Commodity Team Motivation and Performance. Journal of Purchasing & Supply Management, 14(1), 15-27.

Entchelmeier, A. (2008). Supply Performance Measurement: Leistungsmessung in Einkauf und Supply Management. Diss., European Business School, Oestrich-Winkel.

Eßig, M. (2003). Supplier Lifetime Value als Ansatz zur Neubewertung von Lieferantenbeziehungen. In: R. Bogaschewsky (Ed.), Integrated Supply Management – Einkauf und Beschaffung (323-346). Köln: Deutscher Wirtschaftsdienst.

Eßig, M. (2007). Value Sourcing: Aspekte eines wertorientierten Controlling im Beschaffungs- und Supply Chain Management. In: F. J. G. Sanz, K. Semmler & J. Walther (Eds.), Die Automobilindustrie auf dem Weg zur globalen Netzwerkkompetenz: Effiziente und flexible Supply Chains erfolgreich gestalten (231-247). Berlin, Heidelberg, New York: Springer.

Eßig, M. & Präuer, A. (2004). Integriertes Beschaffungs- und Supply Chain-Controlling. Supply Chain Managment, 4(4), 7-14.

Evans, M. G. (1970). Herzberg's Two-factor Theory of Motivation: Some Problems and a Suggested Test. Personnel Journal, 49(1), 32-34.

Fearon, H. E. & Bales, A. W. (1995). Purchasing of Nontraditional Goods and Services. Tempe, AZ: Center for Advanced Purchasing Studies.

Fearon, H. E., Dobler, D. W. & Killen, K. H. (1992). The Purchasing Handbook (5th ed.). New York: McGraw-Hill.

Fisher, J. (1995). Contingency-based Research on Management Control Systems: Categorization by Level of Complexity. Journal of Accounting Literature, 14, 24-53.

Flowers, S. (2007). Organizational Capabilities and Technology Acquisition: Why Firms Know Less than They Buy. Industrial & Corporate Change, 16(3), 317-346.

Flyvbjerg, B. (2006). Five Misunderstandings about Case-Study Research. Qualitative Inquiry, 12(2), 219-245.

Fontana, A. & Frey, J. H. (2000). The Interview: From Structured Questions to Negotiated Text. In: N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of Qualitative Research (2nd ed., 645-672). Thousand Oaks, CA: Sage.

Fraser Johnson, P., Leenders, M. R. & Fearon, H. E. (1999). The Chief Purchasing Officer: Previous Background and Experience. European Journal of Purchasing & Supply Management, 5(2), 95-101.

Fredendall, L. D., Hopkins, C. D. & Bhonsle, A. (2005). Purchasing's Internal Service Performance: Critical External and Internal Determinants. Journal of Supply Chain Management, 41(2), 26-38.

Friedl, B. (1990). Grundlagen des Beschaffungscontrolling. Diss., Eberhards-Karls-Universität Tübingen, Tübingen.

Fudenberg, D. & Tirole, J. (1991). Game Theory. Cambridge, MA: MIT Press.

Gebert, K. (2011). Performance Control in Buyer-Supplier-Relationships: The Design and Use of Formal Management Control Systems. Diss., University of St.Gallen, St. Gallen.

Ghingold, M. & Wilson, D. T. (1998). Buying Center Research and Business Marketing Practice: Meeting the Challenge of Dynamic Marketing. Journal of Business & Industrial Marketing, 13(2/3), 96-108.

Gillenkirch, R. M. & Arnold, M. C. (2008). State of the Art des Behavioral Accounting. WIST Wirtschaftswissenschaftliches Studium, 37(3), 128-134

Giunipero, L. C. & Vogt, J. F. (1997). Empowering the Purchasing Function: Moving to Team Decisions. International Journal of Purchasing & Materials Management, 33(1), 8-15.

Gleich, R., Henke, M., Rast, C. & Schentler, P. (2010). Beschaffungs-Controlling. Freiburg, Berlin, München: Haufe.

Glock, C. & Bogaschewsky, R. (2009). An Efficiency-based Framework for Determining Organizational Costs in Purchasing. Paper presented at the 18th IPSERA Conference 2009, Oestrich-Winkel.

Greenley, G. E. & Matcham, A. S. (1986). Conceptual and Methodological Issues in Buying Centre Research. European Journal of Marketing, 20(7), 50-63.

Grønhaug, K. (1976). Exploring Environmental Influences in Organizational Buying. Journal of Marketing Research, 13(3), 225-229.

Hallenbeck Jr, G. S., Hautaluoma, J. E. & Bates, S. C. (1999). The Benefits of Multiple Boundary Spanning Roles in Purchasing. Journal of Supply Chain Management, 35(2), 38-43.

Hambrick, D. C. & Lei, D. (1985). Toward an Empirical Prioritization of Contingency Variables for Business Strategy. Academy of Management Journal, 28(4), 763-788.

Handfield, R. B. (1993). A Resource Dependence Perspective of Just-in-Time Purchasing. Journal of Operations Management, 11(3), 289-311.

Hartmann, E., Entchelmeier, A., Henke, M. & Jahns, C. (2008a). A Theory-based Framework for Integrated Supply Performance Measurement. In: D. Specht (Ed.), Strategische Bedeutung der Produktion: Tagungsband der Herbsttagung 2006 der Wissenschaftlichen Kommission Produktionswirtschaft im VHB (129-145). Wiesbaden: Dt. Univ.-Verl.

Hartmann, E., Trautmann, G. & Jahns, C. (2008b). Organisational Design Implications of Global Sourcing: A Multiple Case Study Analysis on the Application of Control Mechanisms. Journal of Purchasing and Supply Management, 14(1), 28-42.

Heckhausen, J. & Heckhausen, H. (2010). Motivation und Handeln: Einführung und Überblick. In: J. Heckhausen & H. Heckhausen (Eds.), Motivation und Handeln (4th ed.). Berlin, Heidelberg, New York: Springer.

Hemsworth, D., Sánchez-Rodríguez, C. & Bidgood, B. (2005). Determining the Impact of Quality Management Practices and Purchasing-related Information Systems on Purchasing Performance: A Structural Model. Journal of Enterprise Information Management, 18(2), 169-194.

Hendrick, T. E. & Ruch, W. A. (1988). Determining Performance Appraisal Criteria For Buyers. Journal of Purchasing & Materials Management, 24(2), 18-26.

Herzberg, F. (1968). One More Time: How Do You Motivate Employees? Harvard Business Review, 46(1), 53-62.

Hill, C. A. & Scudder, G. D. (2002). The Use of Electronic Data Interchange for Supply Chain Coordination in the Food Industry. Journal of Operations Management, 20(4), 375-387.

Hochhold, S. & Rudolph, B. (2011). Principal-Agent-Theorie. In: M. Schwaiger & A. Meyer (Eds.), Theorien und Methoden der Betriebswirtschaft: Handbuch für Wissenschaftler und Studierende (131-145). München: Vahlen.

Hoffman, E. & Spitzer, M. L. (1985). Experimental Law and Economics: An Introduction. Columbia Law Review, 85(5), 991-1036.

Hofmann, C. (2001). Anreizorientierte Controllingsysteme: Budgetierungs-, Ziel- und Verrechnungspreissysteme. Stuttgart: Schäffer-Poeschel.

Hofmann, E., Maucher, D., Hornstein, J. & den Ouden, R. (2012a). Capital Equipment Purchasing: Optimizing the Total Cost of CapEx Sourcing. Berlin, Heidelberg, New York: Springer.

Hofmann, E., Maucher, D., Kotula, M. & Kreienbrink, O. (2012b). Erfolgsmessung und Anreizsysteme im Einkauf: Den Mehrwert der Beschaffung professionell erheben, bewerten und darstellen. Berlin, Heidelberg, New York: Springer.

Holmes, B. J. (1991). Lease-Buy Decision Analysis. International Journal of Purchasing & Materials Management, 27(4), 35-40.

Holschbach, E. & Hofmann, E. (2011). Exploring Quality Management for Business Services from a Buyer's Perspective Using Multiple Case Study Evidence. International Journal of Operations & Production Management, 31(6), 648-685.

Hult, G. T. M. (1997). Measuring Cycle Time of the Global Procurement Process. Industrial Marketing Management, 26(5), 403-412.

Hyde, K. F. (2000). Recognising Deductive Processes in Qualitative Research. Qualitative Market Research, 3(2), 82-89.

Indjejikian, R. J. (1999). Performance Evaluation and Compensation Research: An Agency Perspective. Accounting Horizons, 13(2), 147-157.

Jackson, R. W. (1990). How Multidimensional Is the Purchasing Job? Journal of Purchasing & Materials Management, 26(1), 27-33.

Jahns, C. (2004). Controlling im Einkauf und Supply Management: Neue Ideen für eine rückständige Disziplin. Controlling, 16(4-5), 273-281.

Jaworski, B. J. & Young, S. M. (1992). Dysfunctional Behavior and Management Control: An Empirical Study of Marketing Managers. Accounting, Organizations and Society, 17(1), 17-35.

Jennings, R. G. & Plank, R. E. (1995). When the Purchasing Agent is a Committee Implications for Industrial Marketing. Industrial Marketing Management, 24(5), 411-419.

Jensen, M. C. & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3(4), 305-360.

Jochims, H. (2006). Erfolgsfaktoren von Online-Marketing-Kooperationen. Wiesbaden: Deutscher Universitäts-Verlag.

Johnson, P. F., Klassen, R. D., Leenders, M. R. & Fearon, H. E. (2002). Determinants of Purchasing Team Usage in the Supply Chain. Journal of Operations Management, 20(1), 77-89.

Johnson, P. F. & Leenders, M. R. (2001). The Supply Organizational Structure Dilemma. Journal of Supply Chain Management, 37(3), 4-11.

Johnson, P. F. & Leenders, M. R. (2006). A Longitudinal Study of Supply Organizational Change. Journal of Purchasing & Supply Management, 12(6), 332-342.

Johnson, P. F. & Leenders, M. R. (2008). Building a Corporate Supply Function. Journal of Supply Chain Management, 44(3), 39-52.

Johnson, P. F. & Leenders, M. R. (2010). Minding the Supply Savings Gaps. MIT Sloan Management Review, 51(2), 25-31.

Johnston, W. J. & Bonoma, T. V. (1981). Purchase Process for Capital Equipment and Services. Industrial Marketing Management, 10(4), 253-264.

Johnston, W. J. & Lewin, J. E. (1996). Organizational Buying Behavior: Toward an Integrative Framework. Journal of Business Research, 35(1), 1-15.

Jost, P. J. (2001). Die Prinzipal-Agenten-Theorie im Unternehmenskontext. In: P. J. Jost (Ed.), Die Prinzipal-Agenten-Theorie in der Betriebswirtschaftslehre (11-43). Stuttgart: Schäffer-Poeschel.

Jost, P. J. & Audretsch, D. B. (2001). Die Spieltheorie in der Betriebswirtschaftslehre. Stuttgart: Schäffer-Poeschel.

Joyce, W. B. (2006). Accounting, Purchasing and Supply Chain Management. Supply Chain Management, 11(3), 202-207.

Kaluza, B., Dullnig, H. & Malle, F. (2003). Principal-Agent-Probleme in der Supply Chain: Problemanalyse und Diskussion von Lösungsvorschlägen. Klagenfurt: Universität Klagenfurt, Institut für Wirtschaftswissenschaften.

Kaluza, C. (2010). Konzeption eines erfolgsorientierten Beschaffungscontrolling: theoretische Betrachtungen und empirische Untersuchungen (2nd ed.). München: TCW-Transfer-Centrum.

Kaplan, R. S. & Norton, D. P. (1992). The Balanced Scorecard: Measures That Drive Performance. Harvard Business Review, 70(1), 71-79.

Kaufmann, L. (1995). Strategisches Sourcing. Zeitschrift für Betriebswirtschaft, 47(3), 275-296.

Kaufmann, L. (2001). Internationales Beschaffungsmanagement: Gestaltung strategischer Gesamtsysteme und Management einzelner Transaktionen. Wiesbaden: Dt. Univ.-Verl.

Kaufmann, L., Thiel, C. & Becker, A. (2005). Überblick über das Beschaffungscontrolling. In: U. Schäffer (Ed.), Bereichscontrolling: Funktionspezifische Anwendungsfehler, Methoden und Instrumente (3-21). Stuttgart: Schäffer-Poeschel.

Koppelmann, U. (2003). Beschaffungsmarketing. Berlin, Heidelberg, New York: Springer.

Kotteaku, A. G., Laios, L. G. & Moschuris, S. J. (1995). The Influence of Product Complexity on the Purchasing Structure. Omega, 23(1), 27-39.

Krause, D. R., Pagell, M. & Curkovic, S. (2001). Toward a Measure of Competitive Priorities for Purchasing. Journal of Operations Management, 19(4), 497-512.

Kubicek, H. (1977). Heuristische Bezugsrahmen und heuristisch angelegte Forschungsdesigns als Elemente einer Konstruktionsstrategie empirischer Forschung. In: R. Köhler (Ed.), Empirische und handlungstheoretische Forschungskonzeptionen in der Betriebswirtschaftslehre: Bericht über die Tagung des Verbandes der Hochschullehrer für Betriebswirtschaft e.V. (5-36). Stuttgart: Poeschel.

Kühn, S., Platte, I. & Wottawa, H. (2005). Psychologische Theorien für Unternehmen (2nd ed.). Göttingen: Vandenhoeck & Ruprecht.

Kumar, A., Ozdamar, L. & Chai Peng, N. (2005). Procurement Performance Measurement System in the Health Care Industry. International Journal of Health Care Quality Assurance, 18(2/3), 152-166.

Kümpel, T. & Deux, T. (2003). Kennzahlen im strategischen Einkaufscontrolling. Controller Magazin, 28(3), 243-251.

Lambros, G. L. & Socrates, J. M. (2001). The Influence of Enterprise Type on the Purchasing Decision Process. International Journal of Operations & Production Management, 21(3), 351-372.

Large, R. (2009). Strategisches Beschaffungsmanagement: Eine praxisorientierte Einführung. Mit Fallstudien. Wiesbaden: Gabler.

Latham, G. P. & Pinder, C. C. (2005). Work Motivation Theory and Research at the Dawn of the Twenty-first Century. Annual Review of Psychology, 56(1), 485-516.

Laux, H. & Liermann, F. (2005). Grundlagen der Organisation: Die Steuerung von Entscheidungen als Grundproblem der Betriebswirtschaftslehre. Berlin, Heidelberg, New York: Springer.

Leenders, M. R., Johnson, P. F., Flynn, A. E. & Fearon, H. E. (2009). Purchasing Supply Management (13th ed.). New York, NY: McGraw-Hill Education.

Lewin, J. E. & Donthu, N. (2005). The Influence of Purchase Situation on Buying Center Structure and Involvement: A Select Meta-analysis of Organizational Buying Behavior Research. Journal of Business Research, 58(10), 1381-1390.

Libby, T. & Waterhouse, J. H. (1996). Predicting Change in Management Accounting Systems. Journal of Management Accounting Research, 8, 137-150.

Lipe, M. & Salterio, S. (2000). The Balanced Scorecard: Judgmental Effects of Common and Unique Performance Measures. The Accounting Review, 75(3), 283-298.

Lipe, M. G. & Salterio, S. (2002). A Note on the Judgmental Effects of the Balanced Scorecard's Information Organization. Accounting, Organizations and Society, 27(6), 531-540.

Liyanarachchi, G. A. (2007). Feasibility of Using Student Subjects in Accounting Experiments: A Review. Pacific Accounting Review, 19(1), 47-67.

Luzzini, D. & Ronchi, S. (2011). Organizing the Purchasing Department for Innovation. Operations Management Research, 4(1), 14-27.

Maines, L. A., Salamon, G. L. & Sprinkle, G. B. (2006). An Information Economic Perspective on Experimental Research in Accounting. Behavioral Research in Accounting, 18, 85-102.

Maslow, A. H. (1943). A Theory of Human Motivation. Psychological Review, 50(4), 370-396.

Mattson, M. & Salehi-Sangari, E. (1993). Making in Purchases of Equipment and Materials: A Four-country Comparison. International Journal of Physical Distribution & Logistics Management, 23(8), 16-30.

Maucher, D. & Hofmann, E. (2013). Savings Measurement for Capital Equipment Purchasing: Challenges and Conceptual Model (forthcoming). International Journal of Productivity and Performance Management.

Maucher, D., Stölzle, W. & Hofmann, E. (2012). Procurement Value Added – Ein Ansatz zu wertorientierten Messung des Beschaffungserfolgs Supply Management Research. Aktuelle Forschungsergebnisse 2012 (55-78). Wiesbaden: Gabler.

Mayer, V. (2011). Motivationstheorien. In: M. Schwaiger & A. Meyer (Eds.), Theorien und Methoden der Betriebswirtschaft: Handbuch für Wissenschaftler und Studierende (225-249). München: Vahlen.

McCabe, D. L. (1987). Buying Group Structure: Constriction at the Top. Journal of Marketing, 51(4), 89-98.

McClelland, D. C. (1961). The Achieving Society. Princeton: Van Nostrand.

McClelland, D. C. (1993). The Achievement Motive in Economic Growth. In: J. T. Passe-Smith & M. A. Seligson (Eds.), Development and Underdevelopment: The Political Economy of Global Inequality (141-157). Boulder, CO: Lynne Rienner Publishers.

McCutcheon, D. M. & Meredith, J. R. (1993). Conducting Case Study Research in Operations Management. Journal of Operations Management, 11(3), 239-256.

Mentzer, J. T. & Kahn, K. B. (1995). A Framework of Logistics Research. Journal of Business Logistics, 16(1), 231-250.

Meyer, M. & Rigsby, J. T. (2001). A Descriptive Analysis of the Content and Contributors of Behavioral Research in Accounting 1989-1998. Behavioral Research in Accounting, 13(1), 253-278.

Miles, M. B. & Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. London: Sage Publications.

Monczka, R. M., Trent, R. J. & Handfield, R. B. (2002). Purchasing and Supply Chain Management (2nd ed.). Cincinatti, OH: South-Western College Pub.

Morssinkhof, S., Wouters, M. & Warlop, L. (2011). Effects of Providing Total Cost of Ownership Information on Attribute Weights in Purchasing Decisions. Journal of Purchasing & Supply Management, 17(2), 132-142.

Moses, A. & Åhlström, P. (2008). Problems in Cross-functional Sourcing Decision Processes. Journal of Purchasing & Supply Management, 14(2), 87-99.

Murphy, D., Pearson, J. & Siferd, S. (1996). Evaluating Performance of the Purchasing Department Using Data Envelopment Analysis. Journal of Business Logistics, 17(2), 77-91.

Narasimhan, R. A. M., Aram, J. J., Carter & Joseph, R. (2001). An Empirical Examination of the Underlying Dimensions of Purchasing Competence. Production and Operations Management, 10(1), 1-15.

Neely, A., Gregory, M. & Platts, K. (2005). Performance Measurement System Design: A Literature Review and Research Agenda. International Journal of Operations & Production Management, 25(12), 1228-1263.

Nerdinger, F., Blickle, G. & Schaper, N. (2011). Arbeits- und Organisationspsychologie. Berlin, Heidelberg, New York: Springer.

Newman, R. G. & Simkins, R. J. (1998). Capital Equipment Buying Handbook. New York, NY: Amacom.

Nicosia, F. M. & Wind, Y. (1977). Behavioral Models of Organizational Buying Processes. In: F. M. Nicosia & Y. Wind (Eds.), Behavioral Models for Market Analysis: Foundations for Marketing Action. Hinsdale, IL: Dryden Press.

Nollet, J., Calvi, R., Audet, E. & Côté, M. (2008). When Excessive Cost Savings Measurement Drowns the Objectives. Journal of Purchasing & Supply Management, 14(2), 125-135.

Noordewier, T. G., John, G. & Nevin, J. R. (1990). Performance Outcomes of Purchasing Arrangements in Industrial Buyer-Vendor Relationships. Journal of Marketing, 54(4), 80-93.

Novack, R. A. & Simco, S. W. (1991). The Industrial Procurement Process: A Supply Chain Perspective. Journal of Business Logistics, 12(1), 145-167.

Otley, D. T. (1980). The Contingency Theory of Management Accounting: Achievement and Prognosis. Accounting, Organizations and Society, 5(4), 413-428.

Pagell, M. & Das, A. (1996). Motivating the Purchasing Professional. International Journal of Purchasing & Materials Management, 32(3), 27-34.

Parikh, M. A. & Joshi, K. (2005). Purchasing Process Transformation: Restructuring for Small Purchases. International Journal of Operations & Production Management, 25(11), 1042-1061.

Perry, J. H. (1987). A Conceptual Framework for Evaluating Capital Equipment Purchases. Journal of Purchasing & Materials Management, 23(4), 32-38.

Peter, J. P. (1981). Construct Validity: A Review of Basic Issues and Marketing Practices. Journal of Marketing Research, 18(2), 133-145.

Pfaff, D. & Pfeiffer, T. (2001). Controlling. In: P. J. Jost (Ed.), Die Prinzipal-Agenten-Theorie in der Betriebswirtschaftslehre (359-394). Stuttgart: Schäffer-Poeschel.

Pfeffer, J. & Sutton, R. I. (1999). The Knowing-Doing Gap: How Smart Companies Turn Knowledge into Action. Boston: Harvard Business School Press.

Piontek, J. (2004). Beschaffungscontrolling. München, Wien: Oldenbourg.

Poggensee, K. (2009). Investitionsrechnung: Grundlagen - Aufgaben - Lösungen. Wiesbaden: Gabler.

Pohl, M. & Förstl, K. (2011). Achieving Purchasing Competence through Purchasing Performance Measurement System Design: A Multiple-case Study Analysis. Journal of Purchasing & Supply Management, 17(4), 231-245.

Porter, L. W. & Lawler, E. E. (1968). Managerial Attitudes and Performance. Homewood: R. D. Irwin.

Quitt, A. (2010). Measuring Supply Management's Budget Effects: Introduction of Return on Spend as an Indicator of Supply Management's Financial Effectiveness. Diss., European Business School, Oestrich-Winkel.

Raffée, H. & Abel, B. (1979). Aufgaben und aktuelle Tendenzen der Wissenschaftstheorie in den Wirtschaftswissenschaften. In: H. Raffée & B. Abel (Eds.), Wissenschaftstheoretische Grundlagen der Wirtschaftswissenschaften (1-27). München: Vahlen.

Reinschmidt, J. (1989). Beschaffungs-Controlling mit Kennzahlensystemen. Bergisch Gladbach: Josef Eul.

Reiss, S. (2002). Who Am I? 16 Basic Desires that Motivate Our Actions Define Our Persona. New York: Berkley Pub.

Riahi-Belkaoui, A. (2002). Behavioral Management Accounting. Westport, London: Quorum Books.

Rich, V. (2007). Interpreting the Balanced Scorecard: An Investigation into Performance Analysis and Bias. Measuring Business Excellence, 11(1), 4-11.

Robbins, L. (2007). An Essay on the Nature and Significance of Economic Science. Auburn, AL: Ludwig von Mises Institute.

Robinson, P. J. & Faris, C. W. (1967). Industrial Buying and Creative Marketing. Boston, MA: Allyn and Bacon.

Roodhooft, F. & Konings, J. (1997). Vendor Selection and Evaluation an Activity Based Costing Approach. European Journal of Operational Research, 96(1), 97-102.

Rozemeijer, F. (2000). How to Manage Corporate Purchasing Synergy in a Decentralised Company? Towards Design Rules for Managing and Organising Purchasing Synergy in Decentralised Companies. European Journal of Purchasing & Supply Management, 6(1), 5-12.

Rubin, H. J. & Rubin, I. (1995). Qualitative Interviewing: The Art of Hearing Data. London: Sage Publications.

Sánchez-Rodríguez, C., Martínez-Lorente, Á. R. & Clavel, J. G. (2003). Benchmarking in the Purchasing Function and Its Impact on Purchasing and Business Performance. Benchmarking: An International Journal, 10(5), 457-471.

Sappington, D. E. M. (1991). Incentives in Principal-Agent Relationships. The Journal of Economic Perspectives, 5(2), 45-66.

Saranga, H. & Moser, R. (2010). Performance Evaluation of Purchasing and Supply Management Using Value Chain DEA Approach. European Journal of Operational Research, 207(1), 197-205.

Schentler, P. & Tschandl, M. (2010). Beschaffungs-Controlling: Kosten und Nutzenpotenziale in der Beschaffung zielorientiert steuern. In: R. Gleich, M. Henke, C. Rast & P. Schentler (Eds.), Beschaffungs-Controlling. Freiburg, Berlin, München: Haufe.

Scholz-Reiter, B., Heger, J., Meinecke, C. & Bergmann, J. (2012). Integration of Demand Forecasts in ABC-XYZ Analysis: Practical Investigation at an Industrial Company. International Journal of Productivity and Performance Management, 61(4), 445-451.

Schoonhoven, C. B. (1981). Problems with Contingency Theory: Testing Assumptions Hidden within the Language of Contingency "Theory". Administrative Science Quarterly, 26(3), 349-377.

Schurz, G. (2006). Einführung in die Wissenschaftstheorie. Darmstadt: Wissenschaftliche Buchgesellschaft.

Sheth, J. N. (1973). A Model of Industrial Buyer Behavior. Journal of Marketing, 37(4), 50-56.

Sheth, J. N. (1996). Organizational Buying Behavior: Past Performance and Future Expectations. Journal of Business & Industrial Marketing, 11(3/4), 7.

Slovic, P. & MacPhillamy, D. (1974). Dimensional Commensurability and Cue Utilization in Comparative Judgment. Organizational Behavior & Human Performance, 11(2), 172-194.

Smeltzer, L. R. & Manship, J. A. (2003). How Good Are Your Cost Reduction Measures? Supply Chain Management Review, 7(3), 28-33.

Sousa, R. & Voss, C. A. (2008). Contingency Research in Operations Management Practices. Journal of Operations Management, 26(6), 697-713.

Sprinkle, G. B. (2000). The Effect of Incentive Contracts on Learning and Performance. The Accounting Review, 75(3), 299-326.

Sprinkle, G. B. & Williamson, M. G. (2006). Experimental Research in Managerial Accounting. In: C. S. Chapman, A. G. Hopwood & M. D. Shields (Eds.), Handbooks of Management Accounting Research (Vol. 1, 415-444). Amsterdam: Elsevier.

Staehle, W. H. (1999). Management: Eine verhaltenswissenschaftliche Perspektive (8th ed.). München: Vahlen.

Stanley, L. L. & Wisner, J. D. (1998). Internal Service Quality in Purchasing: An Empirical Study. International Journal of Purchasing & Materials Management, 34(3), 50-60.

Steele, R. & Albright, C. (2004). Games Managers Play at Budget Time. MIT Sloan Management Review, 45(3), 81-84.

Steinmann, H. & Schreyögg, G. (1993). Management. Grundlagen der Unternehmensführung: Konzepte, Funktionen, Fallstudien (4th ed.). Wiesbaden: Westdeutscher Verlag.

Stölzle, W. (2007). Beschaffung als Herausforderung für das Controlling. Controlling & Management, 51(3), 200-203.

Stölzle, W., Heusler, K. F. & Karrer, M. (2001). Die Integration der Balanced Scorecard in das Supply Chain Management - Konzept (BSCM). Logistik Management, 2-3(3), 73-85.

Stoppel, M., Wierdemann, F., Gauly, C. & Piec, M. (2012). Anreizsysteme im Einkauf: Wie Einkäufer heute motiviert und incentiviert werden. Zürich: Detecon (Schweiz).

Süßmair, A. (2000). Behavioral Accounting. Wiesbaden: Dt. Univ.-Verl.

Talluri, S. (2002). Single Price System Model for Optimal Decisions in Capital Equipment Purchasing. International Journal of Production Research, 40(4), 1003-1016.

Tchokogué, A., Nollet, J. & Gobeil, K. (2011). Supply Structure: The Pendulum in Action. Journal of Purchasing and Supply Management, 17(3), 148-157.

Thomas, R. J. (1982). Correlates of Interpersonal Purchase Influence in Organizations. Journal of Consumer Research, 9(2), 171-182.

Thommen, J. P. & Achleitner, A. K. (2012). Allgemeine Betriebswirtschaftslehre: Umfassende Einführung aus managementorientierter Sicht. Wiesbaden: Gabler.

Torraco, R. J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. Human Resource Development Review, 4(3), 356-367.

Trent, R. J. (1996). Understanding and Evaluating Cross-Functional Sourcing Team Leadership. International Journal of Purchasing & Materials Management, 32(4), 29-36.

Trent, R. J. (2004). The Use of Organizational Design Features in Purchasing and Supply Management. Journal of Supply Chain Management, 40(3), 4-18.

Trent, R. J. & Monczka, R. M. (1994). Effective Cross-Functional Sourcing Teams: Critical Success Factors. International Journal of Purchasing & Materials Management, 30(4), 3-11.

Turnbull, P. W. & Valla, J. P. (1989). Strategies for International Industrial Marketing: The Management of Customer Relationships in European Industrial Markets. New York, NY: Croom Helm.

Ulrich, P. & Hill, W. (1979). Aufgaben und aktuelle Tendenzen der Wissenschaftstheorie in den Wirtschaftswissenschaften. In: H. Raffée & B. Abel (Eds.), Wissenschaftstheoretische Grundlagen der Wirtschaftswissenschaften (161-190). München: Vahlen.

van der Valk, W. & Rozemeijer, F. (2009). Buying Business Services: Towards a Structured Service Purchasing Process. Journal of Services Marketing, 23(1), 3-10.

VDI (2011). Wertanalyse: Das Tool im Value Management (6th ed.). Berlin, Heidelberg, New York: Springer.

Vroom, V. H. (1994). Work and Motivation. New York, London, Sydney: Wiley.

Wagner, S. M. (2004). Gewinnbringender Einsatz der Balanced Scorecard im Beschaffungsmanagement. In: Bundesverband Materialwirtschaft, Einkauf und Logistik (Ed.), Best Practice in Einkauf und Logistik: Erfolgsstrategien der Top-Entscheider Deutschlands (103-115). Wiesbaden: Gabler.

Wagner, S. M. & Kaufmann, L. (2004). Overcoming the Main Barriers in Initiating and Using Purchasing-BSCs. Journal of Purchasing and Supply Management, 10(6), 269-281.

Wagner, S. M. & Weber, J. (2006). Beschaffungscontrolling: Den Wertbeitrag der Beschaffung messen und optimieren. Weinheim: Wiley-VCH.

Ward, S. & Webster, F. E. J. (1991). Organizational Buying Behavior. In: T. S. Robertson & H. H. Kassarjian (Eds.), Handbook of consumer behavior (419-458). Englewood Cliffs, NJ: Prentice-Hall.

Waters-Fuller, N. (1995). Just-in-Time Purchasing and Supply: A Review of the Literature. International Journal of Operations & Production Management, 15(9), 220-236.

Webster, F. E. & Wind, Y. (1972). A General Model for Understanding Organizational Buying Behavior. The Journal of Marketing, 36(2), 12-19.

Webster, J. (1995). Networks of Collaboration or Conflict? Electronic Data Interchange and Power in the Supply Chain. The Journal of Strategic Information Systems, 4(1), 31-42.

Weele, A. J. (1984). Purchasing Control: Performance Measurement and Evaluation of the Industrial Purchasing Function. Diss., University of Technology Eindhoven, Eindhoven.

Wildemann, H. (2004). Wertorientierte Supply Chain Collaboration. In: M. Eßig (Ed.), Perspektiven des Supply Management: Konzepte und Anwendungen. Berlin, Heidelberg, New York: Springer.

Wöhe, G. & Döring, U. (2010). Einführung in die allgemeine Betriebswirtschaftslehre (24th ed.). München: Vahlen.

Wolf, J. (2008). Organisation, Management, Unternehmensführung: Theorie Praxisbeispiele und Kritik (3rd ed.). Wiesbaden: Gabler.

Woodside, A. G. & Liukko, T. (1999). Organizational Buying of Capital Equipment Involving Persons across Several Authority Levels. Journal of Business & Industrial Marketing, 14(1), 30-48.

Xideas, E. & Moschuris, S. (1998). The Influence of Product Type on the Purchasing Structure. European Journal of Marketing, 32(11/12), 936-992.

Yin, R. K. (2009). Case Study Research Design and Methods (4th ed.). Thousand Oaks, CA: Sage.

Young, J. A. & Varble, D. L. (1997). Purchasing's Performance as Seen by Its Internal Customers: A Study in a Service Organization. International Journal of Purchasing & Materials Management, 33(3), 36-41.

Yuthas, K. & Young, S. T. (1998). Material Matters: Assessing the Effectiveness of Materials Management IS. Information & Management, 33(3), 115-124.

Appendices

Appendix A: Maucher, D. and Hofmann, E. (2013). Savings Measurement for Capital Equipment Purchasing: Challenges and Conceptual Model. International Journal of Productivity and Performance Management, 62(5), 490-513.

Appendix B: Maucher, D. (2013). Contingency-based analysis of management control systems: The case of performance and savings measurement for capital equipment purchasing (in review).

Submitted to "Qualitative Research in Accounting and Management" in March 2013.

Appendix C: Maucher, D., Hofmann, E, and Thrane, S. (2013). Effects of intra-organizational control systems on inter- and intra-organizational negotiations: The case of capital equipment purchasing (in review).

Submitted to the "Workshop on Accounting in Networks" (Stockholm, Sweden) / "Industrial Marketing Management" in March 2013.

A. Savings measurement for capital equipment purchasing: Challenges and conceptual model

A.1. Introduction

Capital equipment purchasing (CEP) exerts a significant influence on procurement success. The percentage of total purchase spend for capital equipment averages about 8-11% (CAPS Research, 2005; Fearon & Bales, 1995). But CEP decisions also influence related lifecycle costs (e.g., fuel, maintenance, repairs and operating supplies), which add up to 5% of total purchase spend (Fearon & Bales, 1995), as well as production costs. In evaluating a CEP project, savings measurement plays an important role in procurement performance measurement. However, savings measurement for CEP faces some special challenges. For example, in many cases, it is not possible to compare the actual price with previous prices, as is typically done for production materials, and follow-up costs are partially higher than the pure purchase price.

Despite CEP's significance, savings measurement for CEP has received little attention from practitioners and academics, making it a topic for future research (Quitt, 2010). Most procurement departments, as well as academic literature on savings measurement, focus on savings measurement for regularly procured production materials (Ashenbaum, 2006; Dmytrenko, 1997; Emiliani et al., 2005; Johnson & Leenders, 2010; Nollet et al., 2008; Quitt, 2010; Smeltzer & Manship, 2003). In academic literature, topics like implementing a cost savings measurement system (Nollet et al., 2008), tactics that buyers use to manipulate savings measurement (Emiliani et al., 2005), as well as challenges and recommendations for savings measurement for regularly procured production materials (Johnson & Leenders, 2010) are discussed.

Savings measurement is regarded by many companies as a challenge (Johnson & Leenders, 2010). Furthermore, about 50% of companies are not completely satisfied with the methods used to calculate savings (Maucher et al., 2013). Typical problems include understating as well as overstating savings, manipulability and missing trust in the results. However, the academic literature does not provide an answer to this

problem. In order to be able to address the problems in savings measurement for CEP, we first have to be aware of the challenges involved. Furthermore, it is important to understand which savings measurement system for CEP is appropriate in a specific situation. For example, smaller companies have different needs concerning their savings measurement system than larger companies. Therefore, a major goal of our analysis is to identify the relevant determinants and effects of savings measurement for CEP. Given the topic's practical and academic significance, this article attempts to answer the following research questions (RQs):

- RQ1: How do companies measure savings for CEP and which methods are used?
- RQ2: What are the main challenges for companies with savings measurement for CEP?
- RQ3: Which determinants influence and what are the effects of savings measurement for CEP?

Our research follows an exploratory approach. After presenting a description of the theoretical foundations of CEP and savings measurement (Section A.2), the article presents three cases on savings measurement for CEP from the manufacturing industry and identifies major challenges concerning savings measurement for CEP (Section A.3). Based on general procurement performance measurement literature, more specific savings measurement topics, and literature on procurement organization and behavioral management accounting, the identified challenges are discussed and a conceptual model for savings measurement for CEP is developed (Section A.4). Our paper closes with a short discussion of the results and an outlook (Section A.5).

A.2. Theoretical frame of reference

A.2.1. Capital equipment purchasing

CEP differs substantially from purchasing of other goods and services (Dobler et al., 1990). CEP characteristics can be categorized through defining features related to the capital equipment product, purchasing process and players involved. Product-related characteristics contain the high financial stakes associated with CEP (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002; Talluri, 2002). Since capital equipment

often has a long useful life (Leenders et al., 2009), total cost of ownership (TCO) may far exceed the purchase price and is thus the most important cost factor (Burt et al., 2003; Dobler et al., 1990; Perry, 1987). However, the TCO and income of capital equipment are, to a great extent, uncertain and hence difficult to determine (Discenza & Gurney, 1990; Dobler et al., 1990; Leenders et al., 2009; Monczka et al., 2002; Perry, 1987). Due to high financial stakes and uncertainty of payment flows, risks associated with CEP can be high (Leenders et al., 2009). CEP is therefore a matter of significant strategic importance to top management (Dobler et al., 1990; Leenders et al., 2009). In many cases, the rate of capital equipment's technological obsolescence is high, leading to the question of the optimal replacement time. In this context, technology forecasting plays a prominent role (Leenders et al., 2009). Usually, capital equipment must be integrated into an existing operating environment and interdependences have to be considered (Discenza & Gurney, 1990; Perry, 1987). Other product-related characteristics of CEP are that they often require technical expertise to assess proposals (Fearon et al., 1992) and that capital equipment is often related to services (Monczka et al., 2002). Furthermore, the capital equipment industry is very sensitive to business cycles. This leads to a high variability of capital equipment prices and delivery times (Dobler et al., 1990).

One of the characteristics of the purchasing process is that capital equipment is not purchased frequently (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002). Therefore, purchasers are typically less experienced in CEP (Holmes, 1991). Often buying companies find it hard to acquire, develop and retain the capabilities needed for CEP (Flowers, 2007). Further process-related characteristics are that long-term business relations play an important part (Monczka et al., 2002) and manufacturing lead time can be several months or even years, because capital equipment often has a low degree of standardization (Burt et al., 2003; Dobler et al., 1990).

Player-related CEP characteristics comprise the formation of a buying center by members of the purchasing company (Johnston & Bonoma, 1981; Mattson & Salehi-Sangari, 1993). In these circumstances, the procurement department serves as a facilitator, coordinator and consultant for other departments (Burt et al., 2003; Dobler et al., 1990), although often the procurement department is not involved in CEP at all (Fearon & Bales, 1995). Because of the high financial stakes associated with CEP, several authority levels are likely to be involved (Woodside & Liukko, 1999). Other

player-related characteristics are the importance of international relations and personal negotiations (Newman & Simkins, 1998). The characteristics of CEP generate particular challenges relating to savings measurement.

A.2.2. Savings measurement

Savings measurement is, among other categories (e.g., quality, availability, supplier performance), an important part of performance measurement in procurement (Beidelman, 1987). In most organizations, savings are the most significant measure of procurement performance (Dumond, 1994). In savings measurement, a general distinction is made between cost savings and cost avoidance (Ashenbaum, 2006; CIPS, 2002). While cost savings refer to realized cost changes, cost avoidance refers to future cost changes (Dmytrenko, 1997; Nollet et al., 2008). Cost savings contain hard and soft savings (Nollet et al., 2008). Hard savings are quantitative savings directly impacting the bottom line and easy to calculate (Dmytrenko, 1997; Nollet et al., 2008). Reductions in price, in staff, or in transaction costs are examples of hard savings (Dmytrenko, 1997). Soft savings are qualitative savings with indirect, and difficult to calculate, impact on the bottom line, such as increases in productivity (Dmytrenko, 1997; Nollet et al., 2008). Cost avoidance is related to the reduction or elimination of a possible future cost (Dmytrenko, 1997), for example resisting or delaying an announced price increase (Ashenbaum, 2006).

Between 90% and 95% of organizations employ savings measurement (CAPS Research, 2011; Quitt, 2010), mainly for internal and external communication of procurement performance, proof of procurement achievement, adjustment and optimization of budgets and the following of top-down instructions.

Various methods exist to measure savings in different situations. However, all the methods compare the actual paid price with a reference price. In order to calculate hard savings, common examples of reference prices are (Monczka et al., 2002; Smeltzer & Manship, 2003): previous paid prices, previous paid prices adjusted to market index developments, catalog prices, planned prices (e.g., budget), target prices, average bids, bids of the selected supplier and prices paid by other plants, divisions or business units. In cost avoidance, the reference price is the hypothetical price that might have occurred if the procurement had not obtained a specific action (Monczka et

al., 2002; Smeltzer & Manship, 2003). Despite the significant number of publications on savings measurement in general, none particularly discuss methods and guidelines of savings measurement for CEP.

All savings methods can also be calculated using the TCO instead of the purchase price. The TCO is an accounting technique that is often used to support procurement decisions (Ellram & Siferd, 1998; Wouters et al., 2005). The TCO includes all the costs relevant to the acquisition (e.g., acquisition price, transaction, freight), possession (e.g., storage), use (e.g., energy, service) and disposal of a particular good (Ellram, 1995). In order to calculate the TCO, non-monetary attributes have to be converted into monetary figures (Morssinkhof et al., 2011). A major problem in practice related to TCO calculation consists of the availability and reliability of the necessary information, which are positively related to the use of the TCO for performance measurement and incentive systems (Wouters et al., 2005). Because a TCO calculation does not contain any comparative values, it cannot serve directly as a performance measure in procurement. However, TCO information can provide a useful extension to one-dimensional reference prices in savings measurement.

Savings measurement for CEP faces some special challenges and is therefore a major problem in practice. Because, in many cases, capital equipment is not purchased frequently, the most common savings measurement method, comparing actual paid prices with previous prices, is not applicable. Since purchase price for capital equipment usually amounts to only 30-50% of TCO (Leenders et al., 2009), possible follow-up costs must be taken into account in savings measurement. Because capital equipment is often driven by technology or production, CEP frequently takes place with little or no procurement department involvement (de Boer et al., 2003). Depending on the calculation method, the reference prices in savings measurement for CEP can be influenced by the procurement employees. This leads to the challenge of the occurrence of partial manipulation of the savings results. Johnson and Leenders (2010) discuss general challenges in savings measurement, such as the problems of overstating and understating savings. However, the special challenges concerning savings measurement for CEP have not been discussed in the academic literature so far.

Determinants and effects have been discussed widely for management control systems (MCS) in general (e.g., Chenhall, 2003; Fisher, 1995; Otley, 1980). Contingency theory in MCS states that the benefit from MCS depends on various contingent factors of an organization (Otley, 1980). Typical examples of contingent factors are environment, industry, company size, company strategy and company structure. However, concerning savings measurement for CEP as a special case of MCS, the relevant determinants and effects have not yet been analyzed yet.

A.3. Case studies

A.3.1. Case study methodology

In this section, descriptive case studies are used to depict how companies measure savings for CEP (addressing RQ1) and the challenges they face (addressing RQ2). Because relevant variables in savings measurement for CEP are not yet known in literature, descriptive case studies are appropriate in this situation (Dul & Hak, 2007). The selected case study design was a multiple-case design with savings measurement for CEP as the single-unit of analysis (Yin, 2009). Savings measurement for CEP is conducted particularly in larger manufacturing companies because they often buy capital equipment (Fearon & Bales, 1995) and larger companies are more likely to use more advanced tools in procurement (Gelderman & van Weele, 2005). In considering the RQs, we selected companies which all apply savings measurement for CEP, use different calculation methods and have different challenges related to savings measurement for CEP. In order to maximize the utility of information, cases were selected by variation strategy (Flyvbjerg, 2006). Thus, companies of different sizes, with different spending on capital equipment and from different industries were selected (Table A-1). In order to retain anonymity, each company was given a company label. In the smaller Company A, procurement and procurement performance measurement are less important due to the lower material ratio (share of purchasing volume in relation to sales). Company B is a large manufacturer with an average procurement performance measurement system. Company C is a very large chemical company with a highly developed procurement performance measurement. Table A-6 shows a summary of the interviewees' function within the companies. If the job position of procurement control existed in the company, the responsible employee was

interviewed (company B and C). In company A, no such position exists. However, the purchaser interviewed in company A significantly contributed to the development of the procurement performance measurement system. Therefore, in each case well informed employees were involved in the interviews.

The applied data collection method was semi-structured interviews (Fontana & Frey, 2000) using an interview guideline consisting of six sections covering the following topics: procurement organization, procurement performance measurement, savings measurement in general, savings measurement for CEP, examples of savings measurement for CEP and statistical information. In order to ensure validity in the study, several measures were applied. In most cases, the interviews were carried out face-to-face and were recorded on tape. The respondents were asked to verify the written transcripts of the interviews. In total, five interviews with eight respondents from procurement were each conducted in summer and fall 2011 in Germany, Switzerland and the U.S. (by phone). Two researchers conducted each interview to increase confidence in the findings (Eisenhardt, 1989) and the interviewees were assured that the results would be published anonymously. In addition, further documents on interview guideline topics were analyzed (e.g., organization charts, guidelines to calculate savings and sample calculations) to allow triangulation of multiple data sources. To ensure reliability, a case study protocol and a case study database (interview transcripts, further documents, and audio records) were created.

A.3.2. Case A – construction and building maintenance industry manufacturer

The hybrid procurement organization of Company A consists of a central procurement department and several procurement departments in different factories. Purchasing of direct and indirect materials is organizationally separated. Procurement departments in factories buy most capital equipment, with standardized capital equipment (e.g., forklifts) often purchased by the central procurement department. CEP in Company A is quite highly professionalized. One hundred percent of employees responsible for CEP are academics, compared to 50% in the whole procurement organization. Furthermore, the procurement department is highly involved in CEP from demand assessment up to maintenance support and repair. When appropriate, purchasing decisions for CEP are always based on the TCO. Procurement employees are eligible

for performance bonuses, based on the target achievement of the whole company and the procurement department. Realized savings and successful projects, as well as specific processes and tools (e.g., implementation of e-procurement) each contribute one-third to the procurement department's objectives.

Table A-1: Overview of the case companies

Company	A	B	C
Industry	Manufacturer for the construction and building maintenance industry	Manufacturer of construction materials	Manufacturer in the chemical industry
Material ratio	25%	66%	>60%
Total spend	€ 0.8 bn.	€ 11.9 bn.	>€ 20 bn.
Total spend on capital equipment	€ 63 m.	€ 1.1 bn.	€ 1.7 bn.
Procurement employees	200	800	>1,000
Typical kinds of capital equipment	Buildings, forklifts	Conveying equipment (trucks, excavators), crushing plant	Cars, containers, reactors
Environmental uncertainty	Medium	Low	High

Note: The classification of environmental uncertainty is based on industry turnover volatility in the last ten years (Eurostat, 2012).

Company A regards procurement performance measurement as an important instrument to show the added value of the procurement function. In procurement evaluation, a distinction is made between performance dimensions with measurable bottom line impact (savings and performance) and performance dimensions with non-measurable bottom line impact (efficiency and quality). Savings comprise purchase price changes, rebates / bonuses / discounts, payment terms, committed cost structure changes and design changes with influence on costs. The performance dimension refers to cost increase avoidance and impacts on projects or one-time costs. Procurement efficiency concerns process improvements, added values (e.g., additional features) and soft savings (e.g., efficiency improvements). The fourth dimension refers to changes in product or service quality. In this pattern, savings are just one part of the whole procurement evaluation. As there is no aggregation of the four performance dimensions, a holistic evaluation of the procurement performance depends on the individual judgment of the procurement manager. Company A's major challenge is loss of trust in data when savings are calculated for every procurement task. Changes on the demand side (e.g., reduction in business trips) are the most important measure for the board, but procurement is not perceived to wield influence here. Procurement

evaluation results are documented in a spreadsheet. However, procurement performance measurement is carried out only by the central procurement department, and not by local factories and organizations.

The main challenge for Company A in CEP's savings measurement is missing reference prices. If there is no historical price available, savings for CEP are calculated as the difference between the offer after the technical discussion with the supplier and the final negotiated price. These savings are divided by the depreciation period of the capital equipment and are only reported in the actual year (Table A-2). This procedure often results in a relatively small number with little influence on the purchaser's bonus. Thereby, when taking these figures into account, the TCO and benefits of capital equipment are not considered because the procurement department is worried about their own trustworthiness. Only sometimes are soft savings described in a qualitative way. Referring to manipulation, the interviewee stated: "I have never seen that employees manipulate savings measurement. It certainly happens, but only to a minimal extent."

Table A-2: Example of the quotation method taking into consideration the depreciation period (figures adjusted)

Supplier	A	B	C	D
Initial offer	€ 1,610,000	€ 1,730,000	€ 1,600,000	€ 1,660,000
Offer after the technical discussion	€ 1,600,000	€ 1,650,000	€ 1,590,000	€ 1,630,000
Final negotiated price	€ 1,595,000		€ 1,580,000	
Difference between offer after the technical discussion and final negotiated price (selected supplier)			€ 10,000	
Total savings			€ 2,000	

Note: Final negotiations with suppliers A and C; the selected supplier is supplier C. The depreciation period of the capital equipment is 5 years.

A.3.3. Case B – construction material manufacturer

The procurement organization of Company B consists of a central procurement department and regional offices, as well as a standards and development department. The procurement strategy builds on strong local organizations and global standards (e.g., packaging standards, concentration of spend with key suppliers, focus on TCO). The procurement organization can, therefore, be regarded as a hybrid form.

Organizational separation of CEP and purchasing of other goods, as well as services, is carried out only in larger regional organizations. For CEP, TCO plays an important part in purchasing decisions, especially for production equipment. For example, the annual operating fleet costs for trucks, mixers, pumps and other construction equipment (without labor costs for drivers) are six times higher than the annual purchasing spend for this capital equipment. Indeed, TCO are not considered for low return products, such as support equipment. The procurement department also uses tools to record running time and determine optimal replacement time for capital equipment. The incentive system depends on the regional procurement organization; in many organizations, there is a KPI system, but no bonus system for lower level purchasers. Some regional offices reward target achievement with salary increases for the following year. The absence of an incentive system is viewed somewhat critically, a regional procurement manager actually admitted: "…of course, I think an incentive will increase motivation; at the end, I would say savings will be higher, because I think that is how human beings behave."

The procurement performance measurement distinguishes between hard (quantitative) facts and soft (qualitative) facts, not necessarily linked to targets. The P-BSC, drawn up once a year, encompasses 56 performance indicators (e.g., total spend, savings, processes, inventory and supplier performance). The procurement department also benchmarks to other companies through business consultancies. As Company B sees it, the main challenge in procurement performance measurement is not how to measure, it is how to determine the objective and the strategy of procurement performance measurement and to ensure its importance. Other perceived challenges are to make the numbers credible and to use them to drive performance on different levels.

According to Company B, a major challenge in savings measurement for CEP is, "to define the baseline to know with what to compare the final results." Because, normally, there is no market price for capital equipment available, this commodity group is the only one excluded from the global savings calculation. Savings measurement for CEP is calculated as the difference between the initial and final offer from the selected supplier. According to the standards and development department, the TCO and the net present value (NPV) should be considered in this calculation (Table A-3). But in practice, a regional manager stated "savings measurement of

company B is only based on price and not on TCO." As the initial offer is the baseline for the calculation and not the offer after the technical discussion, it is impossible to measure savings if the last offer's technical details are changed after negotiations. Concerning savings measurement, the interviewees also ask themselves whether this is really the procurement department's value added or whether non-procurement staff negotiated an equal or even better contract. The method introduced to measure savings is critically discussed within the company. Some purchasers think that savings measurement should not only be based on the costs, but also on delivery time, shut down time, performance and equipment capacity. The method also fails to consider interdependences in CEP (e.g., if a purchased excavator fits existing trucks). One regional procurement manager is also dissatisfied with the method and calls for the consideration of other suppliers' proposals in addition to those of the selected supplier.

A.3.4. Case C – chemical company

The procurement organization of Company C has a lead buyer concept, consisting of one central and many local procurement departments. The budget for CEP projects is determined together by product sellers and product producers; procurement is not involved in this process. As it is often difficult to find several suppliers for specific capital equipment, the procurement department always tries to standardize specifications to increase the number of potential suppliers and enable multiple sourcing. The technical and commercial evaluation of different offers is undertaken by a bonus-malus system, where the technical department receives offers, without prices, and has to determine a monetary bonus or malus for each offer based on technical evaluation. The procurement department does the same for commercial aspects and then brings together both evaluations. If running costs occur for capital equipment, TCO are considered in the evaluation. There is a bonus system for employees in the procurement department based on savings and several qualitative criteria. Although the evaluation scale theoretically ranges from 1 to 9, because of budget constraints, only a small range from 4 to 6 is used. Even if a purchaser significantly exceeds his personal targets, he usually does not get a higher evaluation. The interviewee does not desire a bonus, which depends completely on realized savings. He and his colleagues experienced that "savings are quite independent from their performance," instead they depend on the characteristics of the purchasing project, or on chance. If the company –

for example – does not achieve the planned annual order volume, it is almost impossible for the purchaser to reach his savings targets.

Table A-3: Example of the quotation method under consideration of total cost of ownership (figures adjusted)

Price comparison	Initial offer	Final offer
Machine price	€ 1,466,000	€ 1,466,000
- Discount – parts credit		€ - 35,200
- Discount – 100% payment		€ - 7,000
- Discount – freight		€ - 2,000
Import tax	€ 73,300	€ 72,850
Customs clearance and port handling	€ 3,000	€ 3,000
Inland freight and insurance	€ 10,000	€ 10,000
Total machine price	€ 1,552,300	€ 1,507,650
Service rate (per hour)	€ 24	€ 19
Service cost (14 years)	€ 1,016,820	€ 786,660
Service cost (14 years, NPV)	€ 535,043	€ 13,934
- Trade-in	€ - 143,000	€ - 165,000
Total	€ 2,426,120	€ 2,129,310
Total (14 years, NPV)	€ 1,944,343	€ 1,756,584
Savings		
Total machine price		€ 44,650
Service cost		€ 230,160
Service cost (NPV)		€ 121,108
Trade-in		€ 22,000
Total savings		
Total savings		€ 296,810
Total savings (NPV)		€ 187,758
Total savings (percentage)		12.23%
Total savings (percentage, NPV)		9.66%

Procurement performance measurement in Company C involves measuring the costs of the procurement organization, the automation rate of the purchasing processes, the delegated purchasing volume and savings measurement. According to the savings guideline of the company, savings can only be achieved if one or more of the following procurement strategies are applied: demand bundling, increased competition, process optimization, technical standardization or application of best practices and innovations (e.g., early procurement involvement). After selecting the applied savings strategy, the purchaser has to choose the appropriate calculation method by checking which of the following reference prices, in this order, is applicable: benchmark based on published index, benchmark based on other

calculations (e.g., major cost factors), historical price, lowest final price offered before applying a procurement strategy and cost before optimization (e.g., TCO). This savings guideline is applied to all commodity groups, but targets for purchasers depend on the developmental stage of the commodity group. Savings are documented in a separate IT-system; this, however, has no interface to the company's enterprise resource planning system. Savings measurement serves mainly as a marketing instrument for the procurement department and as a basis for the employees' bonus system. One issue is that purchasers fear being allocated a higher savings target for the next year, if they exceed their actual savings target in the current year. Therefore, they only book savings into the system until they have reached their annual target. Another problem is that "according to the savings guideline negative savings also must be reported, but de facto, this is not commonly done." Furthermore, "a target conflict develops because the bonus of the superior, who is able to check the calculation, also depends on the savings of his employees." Altogether, these problems make many people distrust the results of savings measurement and the reported influence of the procurement department on the company's profit. Even purchasers perceive the savings measurement process as a tedious task. Thus, to increase the acceptance of reported figures, the company's main challenge is to make the calculation both justifiable and impossible to manipulate.

If no historical price is available, savings for CEP in Company C are calculated in three different ways (to be applied in this order):

- As the difference between the lowest final offer of an established supplier and the lowest final offer of a new supplier (e.g., increased competition strategy, Table A-4),
- As the difference between the lowest final price offered before applying a procurement strategy and the final acquisition price under strategy application (e.g., a demand bundling strategy) and
- As the reduction in the TCO (e.g., process optimization strategy).

Although purchasers are often creative in finding an appropriate procurement strategy to report savings for a CEP project, savings are booked into the system only in every fifth CEP project. Another problem with savings measurement for CEP is price changes after placing an order. As it is usually impossible to specify a reason for these

changes, they are not considered in savings measurement. Due to these problems, the procurement department is dissatisfied with the methods used for CEP and is considering measuring savings against the planned budget in the future.

Table A-4: Example of the quotation method taking into consideration the supplier status (figures adjusted)

Supplier	**A**	**B**	**C**	**D**
Supplier status	Established supplier	Established supplier	New supplier	New supplier
Initial offer	€ 580,000	€ 600,000	€ 585,000	€ 580,000
Final offer	€ 578,000	€ 592,000	€ 579,000	€ 575,000
Total savings				€ 3,000

Note: Final negotiations with all suppliers. The cheapest established supplier is supplier A; the selected supplier is supplier D.

A.3.5. Major challenges from the cases

According to the presented cases, savings measurement for CEP is always related to certain challenges. Table A-5 addresses RQ2 and lists the main challenges perceived by the analyzed companies, distinguishing between procedure-specific challenges (PsCs) and behavior-specific challenges (BsCs). PsCs are mainly associated with the method used to calculate savings, while BsCs are justified in the behavior of the involved persons.

A.4. Discussion and model

A.4.1. Discussion of procedure-specific challenges

The identified challenges have especially been thematized in the literature on procurement performance measurement, savings measurement, procurement organization and behavioral management accounting. Therefore, these research fields are selected to build the basis for the discussion of the identified challenges. In this section, each PsC will be discussed considering the relevant literature.

PsC1 concerns the definition of the correct reference price. Questions about what constitutes a saving are also issues from savings measurement for other goods and services (Croell, 1977). Using wrong reference prices can lead to over- or understating savings (Nollet et al., 2008). This challenge occurs most often in new purchases and

altered repeat purchases of capital equipment, because previous paid prices, the most common reference prices (CAPS Research, 2011), are not available in these situations. As no "one size fits all approach" exists, a set of rules on when and how to calculate savings has to be established (Johnson & Leenders, 2010).

Table A-5: Procedure- and behavior-specific challenges with savings measurement for capital equipment purchasing

Procedure-specific challenges		Behavior-specific challenges	
PsC1	Definition of the correct reference price (cases B, C).	BsC1	Sometimes purchasers violate savings guidelines (case C).
PsC2	The TCO of capital equipment are rarely included in the calculation (cases A, B).	BsC2	Purchasers only book savings into the system until they have reached their yearly targets (case C).
PsC3	The benefit of capital equipment is usually not considered (case A).	BsC3	Often, only positive savings are reported (case C).
PsC4	The pure involvement of costs in savings measurement disregards critical qualitative aspects of CEP (e.g., time, quality, interdependences) (case B).	BsC4	In some cases, the superior conducts the control, even though his / her bonus also depends on the savings measurement (case C).
PsC5	Price changes after placing an order are often not considered for savings measurement (case C).	BsC5	Savings that are reported to management are often not trusted very much (cases A, B).
PsC6	If considerably fewer orders are placed, savings targets cannot be reached (case C).	BsC6	Often the savings-measurement process is perceived as a tedious task (case C).
		BsC7	If several performance dimensions are reported, a holistic evaluation of the procurement performance depends on individual judgment (case A).

The TCO of capital equipment are rarely included in the savings calculations (PsC2). This is a common problem in savings measurement (Johnson & Leenders, 2010). The TCO perspective considers purchase price and all related costs of the purchasing item (e.g., transportation, inventory, warranty, payment terms, and disposal). The data necessary to consider TCO in savings measurement can, however, be difficult to obtain and calculate (Smeltzer & Manship, 2003). Savings measurement without the consideration of TCO is delusive and may reward harmful behavior (Johnson & Leenders, 2010). This is especially true in savings measurement for CEP because of the relatively low share of purchase price of the TCO. The goal, therefore, should not be to obtain the lowest purchase price (Emiliani et al., 2005), but to focus on TCO in savings measurement (Johnson & Leenders, 2010).

Another PsC in savings measurement for CEP is the lack of consideration of the benefits of capital equipment (PsC3). There is no method currently used incorporating the benefits of capital equipment (e.g., efficiency, productivity), although benefits are

also regarded as a saving (Ashenbaum, 2006; Smeltzer & Manship, 2003). A possible solution to this problem could be the quantification and integration of benefits into a net present value (NPV) calculation as well as consideration of the NPV in savings measurement. The NPV is defined as the sum of the present values of the expected revenues minus the expected expenses. Similar to the TCO calculation, the NPV also does not contain any comparative values. Therefore, in order to evaluate the procurement performance, the NPV can only be used as an input to savings measurement.

PsC4 refers to ignoring critical qualitative CEP aspects. Although the most important procurement measures are not costs, but quality and on-time delivery (Chao et al., 1993; Hendrick & Ruch, 1988), especially in CEP, these criteria are not considered in savings measurement. Interdependences with existing capital equipment are also important CEP qualitative criteria. The aim should be to quantify and integrate these criteria into savings measurement for CEP as well.

Disregarding price changes after placing an order (PsC5) is another PsC. Increased costs are major negative consequences of project changes, among others, such as delays (Andersen et al., 2011). The cost increases for project changes typically range from 3-23% (Love et al., 2004) and are mainly caused by the purchasing company, but also due to errors and omissions in contract documentation (Love & Sohal, 2003). As described in case C, it is difficult to determine the reason for price changes during a project. But it should not be possible to account for savings when there have been massive cost overruns. Savings should thus be calculated at different phases of a CEP project (e.g., planning phase, time of order, project closure).

Not considering volume changes in savings targets for CEP is also very problematic (PsC6). This issue is acknowledged in general savings measurement (Johnson & Leenders, 2010). If the planned purchasing spend is not realized, procurement targets are often impossible to reach. This problem applies especially to CEP, because volatility is particularly high in this procurement field. Therefore, savings targets should be formulated as a function of realized purchasing spend.

As a first summary, it can be said that not considering TCO, monetary benefits, qualitative criteria, subsequent price changes and volume changes in savings measurement can all endanger procurement function objectives. Basing performance

measurement on an incomplete picture can mean that purchasers, during their purchasing decision, do not adequately take into account aspects which are not included in performance measurement (Bushman & Indjejikian, 1993; Hemmer, 1996; Holmstrom & Milgrom, 1991).

A.4.2. Discussion of behavior-specific challenges

Success of performance measurement depends strongly on the consideration of behavior (Holloway et al., 1995; Simons et al., 2000). The cases show that BsCs play an important part in CEP savings measurement. Many of these problems have also been addressed in the general literature on performance and savings measurement.

A major BsC in savings measurement for CEP is manipulation of results. Manipulation has been widely discussed in management accounting and performance measurement literature (Pfeffer & Sutton, 1999; Steele & Albright, 2004). Purchasers also manipulate to achieve more favorable results for themselves in savings measurement (Emiliani et al., 2005). Cost-oriented performance measurement systems in procurement have been blamed for encouraging purchasers to disregard long-term objectives, and improve the procurement department's performance, to the detriment of the overall company performance (Easton et al., 2002). As the cases show, the most common CEP savings measurement manipulation methods are: illegal acts, gaming (or storming) and filtering.

- Illegal acts occur when purchasers violate organizational rules (Birnberg et al., 1983), such as savings guidelines (BsC1). An example would be a purchaser asking a potential supplier for a higher first offer to improve his negotiation success.
- Gaming occurs when the purchaser selects his activities to achieve a more favorable measure while disregarding the company's real long-term goals (Birnberg et al., 1983). For example, the purchaser could focus his activities solely on cost savings and ignore qualitative aspects not contained in his personal performance measures. A variant of gaming is the so-called storming, that refers to BsC2 (purchasers only book savings into the system until they have reached their yearly targets). Berliner (1956) describes this phenomenon, which is known as the "ratchet principle", in former Soviet companies.

According to this principle, when a company exceeds a production plan target, the plan target for the following period is increased by the amount achieved above the old target. In the following period, the manager must work even harder to exceed the raised target. In awareness of this principle, managers retain a margin of safety in their production targets, so that they can exceed their plans year by year.

- A situation when only price reductions are reported, but not price increases (Johnson & Leenders, 2010) refers to the manipulation method of filtering (BsC3). Filtering means that only positive performance results are reported, not negative results (Birnberg et al., 1983).

Performance measure manipulation by employees is always a problem (Jaworski & Young, 1992), especially when a bonus depends on performance measures (Jensen, 2003). Possible ways to reduce manipulation are the use of multi-dimensional savings measures (Easton et al., 2002; Fisher & Downes, 2008) and realistic target definitions (Emiliani et al., 2005; Newman, 2009).

Another behavior-specific problem occurs when the superior conducts the control, even though his bonus also depends on savings measurement (BsC4). This seems to be a goal conflict, as in most cases the performance measurement of the superior will depend on the subordinate's performance (Knowlton Jr & Mitchell, 1980). If the superior's bonus depends on the subordinate's performance, the superior evaluates the subordinate's performance more positively than if the bonus is independent (Ilgen et al., 1981). Transferred to the control of savings measurement for CEP, this shows that while the superior also knows how to manipulate (Emiliani et al., 2005), he is not interested in revealing manipulations.

Savings are an integral part of the procurement performance report to management (Beidelman, 1987). However, common manipulation of savings measures means that reported savings to management are often distrusted (BsC5). There is also a credibility problem in figures reported on savings measurement for other goods and services (Cavinato, 1987; Johnson & Leenders, 2010). In general, managers will suspect manipulation if the benefit to the purchaser is high, the chance of the manipulation being detected is low and the cost to the purchaser is low, should the manipulation be detected (Millar & Millar, 1997). Other reasons for management's distrust of reported

savings are unreliable data bases and inconsistent baselines (Quitt, 2010). A way to increase management trust in reported performance measures is to raise the accuracy of the performance measurement system and decrease the dependency between personal performance and personal outcomes (Mayer & Davis, 1999).

Purchasers often find CEP savings measurement tedious (BsC6). Pagell and Das (1996) have shown that purchasers' motivations are influenced by the design of the performance measurement system and the perceived fairness of the compensation system. Therefore, in order to increase motivation of the purchasers, proper and fair systems for performance measurement and compensation must be developed.

Finally, the holistic evaluation of CEP is challenging if several performance dimensions are reported (BsC7). Dumond (1994) states that many procurement departments suffer from too many measures. Several experiments have shown that managers do not weight performance measures equally, if several measures (e.g., common and unique measures, financial and non-financial measures and TCO information) are presented (Dilla & Steinbart, 2005; Lipe & Salterio, 2000; Morssinkhof et al., 2011; Rich, 2007; Schiff & Hoffman, 1996; Slovic & MacPhillamy, 1974; Williams et al., 1986). The pattern in which the performance measures are presented also influences managers' judgment (Williams et al., 1986). Thus, the goals should be reducing the number of different performance measures in CEP and developing one comprehensive savings measure.

As an interim conclusion from BsCs, it can be said that three of the identified challenges deal with manipulation in savings measurement. Other important aspects are control, motivation, management trust and judgment. Furthermore, it can be said that manipulation and the design of savings measurement for CEP influence management's trust of CEP's savings measurement results.

A.4.3. Initial propositions and preliminary conceptual model

To answer RQ3 on the determinants and effects of savings measurement for CEP, initial propositions (IPs) are developed based on general management accounting, performance management and procurement performance management literature. It is assumed that general findings can be transferred to savings measurement for CEP

when formulating IPs. Furthermore, the findings are compared with the results of the case study (see Table A-7 for details).

IP1 states that one major determinant of savings measurement for CEP may be the external environment. Several studies demonstrate the impact of the organization's environment (e.g., uncertainty, dynamics, hostility and heterogeneity) on management accounting and performance measurement design (Chenhall, 2003; Ewusi-Mensah, 1981; Gordon & Narayanan, 1984; Govindarajan, 1984; Waterhouse & Tiessen, 1978). It is, for example, expected that companies with high environmental uncertainty will use a more subjective savings measurement approach, while companies with low environmental uncertainty will use a more formalized savings measurement approach (Govindarajan, 1984). This proposition is also supported by the cases. Uncertainty of the external environment was measured by industry-specific sales developments from 2001 to 2010 in the European Union (Eurostat, 2012). An uncertain external environment was assumed for industries with a high sum of negative sales developments. Our results, for example, revealed that company B, with its high environmental uncertainty, is the only company without a savings system or tool and therefore has low degree of formalization.

The second determinant of the implementation, design and result usage of savings measurement for CEP is composed of internal company-specific factors (IP2). Examples of company-specific factors are: structure of an organization (Chenhall, 2003; Gordon & Narayanan, 1984; Waterhouse & Tiessen, 1978), company size (Chenhall, 2003), company culture (Chenhall, 2003; de Waal, 2003; Franco & Bourne, 2003), company strategy (Chenhall, 2003), industry (Franco & Bourne, 2003), managers' attitude toward performance management (de Waal, 2003), experience (Cuthbertson & Piotrowicz, 2011), IT tools (Franco & Bourne, 2003) and procurement department status (Kumar et al., 2005). As an example, we anticipate that procurement departments with a low status in an organization have a less complex savings measurement design than procurement departments with a high status (Kumar et al., 2005), and this is clearly supported by the case results. Company C is the only company where procurement has a high status in the company board and it is also the only company that integrates TCO into its savings, at least partially, making the calculation more complex. We further expect large organizations to have a more formalized savings measurement design than small organizations (Chenhall, 2003).

Internal company-specific factors may also influence manipulation of CEP's savings measurement methods (IP3). An example is the positive relationship between a manager's perceived peer's and a manager's actual dysfunctional behavior (Jaworski & Young, 1992). Furthermore, we expect manipulation in savings measurement for CEP to increase with purchasing spend, which is also the case for the companies being analyzed.

However, implementation, design and result usage of savings measurement for CEP may influence manipulation (IP4). According to management accounting and procurement performance measurement literature, performance measurement methods used, performance dimensions and bonus dependency of the measures, as well as the target's feasibility, have an influence on method manipulation and dysfunctional behavior (Chu et al., 2011; Easton et al., 2002; Emiliani et al., 2005; Fisher & Downes, 2008; Jensen, 2003; Newman, 2009). For example, the use of multi-dimensional savings measures, realistic savings targets and independence between the savings results and the individual bonus are expected to decrease manipulation. This proposition is supported by a statement from the head of procurement in company B: "Reputed figures can be manipulated, hence one of the duty of our company are open targets and many components which makes manipulation difficult. Benefits are measured in context not in isolation."

IP5 states that implementation, design and result usage of savings measurement for CEP may be related to management trust and judgment of CEP's savings measurement results. Several analyses show that measurement accuracy, consistency and data reliability positively affect management trust in performance measurement (Mayer & Davis, 1999; Millar & Millar, 1997; Quitt, 2010). Additionally, the pattern, in which the performance measures are presented, and the types of measures influence management's judgment of the reported results (Dilla & Steinbart, 2005; Lipe & Salterio, 2000; Morssinkhof et al., 2011; Rich, 2007; Schiff & Hoffman, 1996; Slovic & MacPhillamy, 1974; Williams et al., 1986). As an example, we expect that, according to Lipe and Salterio (2000), commonly used CEP performance measures may have a greater weight in decision makers' judgment than unique measures. IP5 is underlined by the purchaser from company A, who states that if you calculate savings too generously, people do not trust them any more. Manipulation of CEP's savings measurement methods, in turn, is expected to negatively influence management trust

of CEP's savings measurement results (IP6). It seems logical that dysfunctional behavior leads to a loss of trust among peers (Dutton & Heaphy, 2003), which was also confirmed by the case companies.

Furthermore, implementation, design and result usage of savings measurement for CEP may have an effect on CEP's performance (IP7). Performance measurement design and maturity level, as well as the bonus system, influence the company performance and the procurement performance (Andersen et al., 2011; Dumond, 1994; Evans, 2004). For instance, we expect that the maturity level of savings measurement for CEP is positively related to CEP's performance (Evans, 2004). IP7 is also supported by the case study. Company B, for example, has a lower maturity level in savings measurement for CEP (concerning the existence of a savings system or tool and consideration of TCO or leasing) and the self-assessment of CEP performance is also lower compared to that of companies A and C.

IP8 states that also management trust and judgment of CEP's savings measurement results may influence CEP's performance. Management trust is expected to positively affect a subordinate's performance (Brower et al., 2009) and therefore also CEP's performance. Since management judgment influences major decision making in CEP, judgment may also affect performance of CEP. However, this relationship was not analyzed in our research because trust is difficult to measure properly in case studies.

A conceptual model is formulated based on the identified IPs. As opposed to a framework, which can be used as guidance for specific tasks or problems a conceptual model is a simplified representation of reality (Greca & Moreira, 2000). The preliminary conceptual model (Figure A-1) shows the identified IPs in the overall context and integrates procedure- and BsCs. The model states that CEP performance depends on the fit between the adoption of savings measurement for CEP and external as well as internal factors and thus refers to contingency theory (van de Ven & Drazin, 1985). Therefore, there seems to be no best practice in implementation, design and result usage of savings measurement for CEP but only a best practice in each situation. Furthermore, the model states that an appropriate design and result usage of savings measurement for CEP can reduce manipulation and raise management trust which leads to higher performance of CEP. Principal-agent theory can contribute to the explanation of this statement. By implementation of relevant KPIs, performance

standards and appropriate incentive systems information asymmetries between the CPO (principal) and the purchaser (agent) can be reduced (Hartmann et al., 2008).

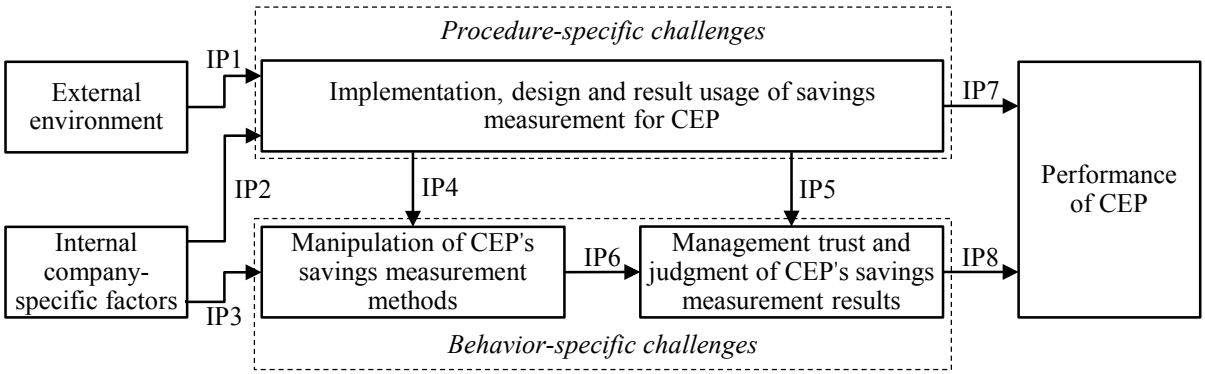

Figure A-1: Preliminary conceptual model

A.5. Conclusion and outlook

Our study presents practical PsCs and BsCs that must be addressed. The six PsCs in savings measurement for CEP primarily address topics concerning components and calculation methods. The seven BsCs deal mainly with manipulation, trust and judgment in savings measurement for CEP. BsCs can often be explained by principal-agent theory and are frequently related to information asymmetries, such as hidden actions and hidden information. In many cases, the challenges described have been discussed in the literature on procurement performance measurement, savings measurement, procurement organization and behavioral management accounting. However, the discussion in the literature often does not consider any of the special features of CEP. Analysis of these research areas leads to a preliminary conceptual model for CEP savings measurement. On the one hand, the formulated propositions state that savings measurement for CEP is influenced by internal and external determinants. And on the other hand it affects CEP's performance and manipulation, trust, as well as the judgment of CEP's savings measurement results.

The results of our analysis offer several managerial implications. In order to improve accuracy, constancy and behavioral aspects of savings measurement for CEP, the following measures should be implemented:

- Multi-dimensional inputs, such as TCO, benefits and qualitative aspects, should be considered in the calculation and aggregated to one single measure.

- Savings should be calculated at different phases of a CEP project.
- Guidelines on how to proceed in savings measurement should be established.
- Audits of results should be performed by an independent party.
- Realistic savings targets – as a function of realized purchasing spend – should be formulated.

Additionally, principal-agent theory implies further measures to reduce information asymmetries (cf. Hartmann et al., 2008):

- Derivation of a CEP savings standard from CEP strategy with concrete individual goals.
- Integrating the CEP savings measure into a holistic procurement performance measurement system.
- If the applied CEP savings measure is strongly influenced by exogenous uncertainty and might be subject to manipulation it should be combined together with other CEP performance measures.
- The CEP savings measures should be connected more closely to incentive systems the lower the purchaser's risk aversion, the higher the accuracy of the measure and the fewer the manipulation possibilities of the measure (cf. Pfaff & Pfeiffer, 2001).

In recent years, multi-dimensional procurement performance measurement instruments, such as the purchasing-balanced scorecard (Wagner & Kaufmann, 2004) and data envelopment analysis (Easton et al., 2002; Murphy et al., 1996) have gained importance compared with cost-oriented savings measurement. However, savings measurement is still the most important dimension within these multi-dimensional instruments and should also be a multi-dimensional measure itself. Moreover, value-based procurement performance measurement instruments, which consider the cost of capital in addition to profit, have received increased attention (e.g., Dumond, 1994). The value-based perspective ensures that the procurement performance serves to increase the company value (Schnetzler et al., 2007). So far, little attention has been paid to the value-based perspective of savings measurement.

Furthermore, an analysis of only three cases is not representative and therefore constitutes a major limitation of this research. For example, all the analyzed companies

are from the manufacturing industry. Companies from other industries, such as the service industry or the trade sector, might face different challenges in savings measurement for CEP. We anticipate the discovery of further challenges in a broader analysis involving more companies. Furthermore, the small number of cases from the manufacturing industry does not allow generalization for this industry. Although we tried to involve appropriate respondents, the position of the respondents within the companies might also have an influence on the results.

The analyzed literature does not cover the entire theme of the identified challenges. Also, the conceptual model presented, based on the identified challenges and the relevant literature, is not yet complete. There may well be further determinants and effects of savings measurement for CEP.

The limitations of this analysis provide a basis for further research. To examine the preliminary conceptual model, further studies should be conducted. Because the behavioral aspects of the conceptual model (manipulation, trust and judgment) are difficult to examine in case studies or surveys, experimental research concerning this topic could be conducted. Finally, future research could develop a best-practice method for savings measurement for CEP that also considers the value-based perspective.

References

Andersen, B., Nils, O. E. O., Onsøyen, L. & Spjelkavik, I. (2011). Post-project Changes: Occurrence, Causes, and Countermeasures. International Journal of Managing Projects in Business, 4(2), 308-328.

Ashenbaum, B. (2006). Defining Cost Reduction and Cost Avoidance. Tempe, AZ: Center for Advanced Purchasing Studies.

Beidelman, K. (1987). Purchasing and Profit: Contributions worth Measuring. Journal of Purchasing & Materials Management, 23(3), 2-9.

Berliner, J. S. (1956). A Problem in Soviet Business Administration. Administrative Science Quarterly, 1(1), 86-101.

Birnberg, J. G., Turopolec, L. & Young, S. M. (1983). The Organizational Context of Accounting. Accounting, Organizations and Society, 8(2/3), 111-129.

Brower, H., Lester, S., Korsgaard, M. & Dineen, B. (2009). A Closer Look at Trust Between Managers and Subordinates: Understanding the Effects of Both Trusting and Being Trusted on Subordinate Outcomes. Journal of Management, 35(2), 327-347.

Burt, D. N., Dobler, D. W. & Starling, S. L. (2003). World Class Supply Management: The Key to Supply Chain Management (7th ed.). New York, NY: McGraw-Hill College.

Bushman, R. M. & Indjejikian, R. J. (1993). Stewardship Value of "Distorted" Accounting Disclosures. The Accounting Review, 68(4), 765-782.

CAPS Research (2005). Benchmarking Report Narrative Summary. Focus on ... Capital Spend 2004. Tempe, AZ: Center for Advanced Purchasing Studies.

CAPS Research (2011). Reporting Cost Savings. Tempe, AZ: Center for Advanced Purchasing Studies.

Cavinato, J. L. (1987). Purchasing Performance: What Makes the Magic? Journal of Purchasing & Materials Management, 23(3), 10-16.

Chao, C.-n., Scheuing, E. E. & Ruch, W. A. (1993). Purchasing Performance Evaluation: An Investigation of Different Perspectives. International Journal of Purchasing & Materials Management, 29(3), 33-39.

Chenhall, R. H. (2003). Management Control Systems Design within its Organizational Context: Findings from Contingency-Based Research and

Directions for the Future. Accounting, Organizations and Society, 28(2-3), 127-168.

Chu, H.-L., Cho, C.-C. & Liu, S.-Z. (2011). Effects of Unbalanced Incentive Measures on Buyer Performance - An Empirical Study in Taiwan. International Journal of Productivity and Performance Management, 60(8), 844-856.

CIPS. (2002). Savings. Stamford, UK: Chartered Institute of Purchasing and Supply.

Croell, R. C. (1977). Measuring Purchasing Effectiveness. Journal of Purchasing & Materials Management, 13(1), 3-7.

Cuthbertson, R. & Piotrowicz, W. (2011). Performance Measurement Systems in Supply Chains: A Framework for Contextual Analysis. International Journal of Productivity and Performance Management, 60(6), 583-602.

de Boer, L., Holmen, E. & Pop-Sitar, C. (2003). Purchasing As an Organizational Design Problem: The Case of Non-Product-Related Items and Services. Management Decision, 41(9), 911-922.

de Waal, A. (2003). Behavioral Factors Important for the Successful Implementation and Use of Performance Management Systems. Management Decision, 41(8), 688-697.

Dilla, W. N. & Steinbart, P. J. (2005). Relative Weighting of Common and Unique Balanced Scorecard Measures by Knowledgeable Decision Makers. Behavioral Research in Accounting, 17(1), 43-53.

Discenza, R. & Gurney, B. (1990). New Considerations for Evaluating Capital Equipment Purchases. Production & Inventory Management Journal, 31(2), 33-37.

Dmytrenko, A. L. (1997). Cost Benefit Analysis. Records Management Quarterly, 31(1), 16-20.

Dobler, D. W., Burt, D. N. & Lee, L. (1990). Purchasing and Materials Management: Text and Cases (5th ed.). New York, NY: McGraw-Hill College.

Dul, J. & Hak, T. (2007). Case Study Methodology in Business Research. Burlington, MA: Oxford Butterworth-Heinemann.

Dumond, E. J. (1994). Moving Toward Value-Based Purchasing. International Journal of Purchasing & Materials Management, 30(2), 2-8.

Dutton, J. E. & Heaphy, E. D. (2003). The Power of High-Quality Connections. In: K. S. Cameron, J. E. Dutton & R. E. Quinn (Eds.), Positive Organizational

Scholarship: Foundations of a New Discipline (263-278). San Francisco, CA: Berrett-Koehler.

Easton, L., Murphy, D. J. & Pearson, J. N. (2002). Purchasing Performance Evaluation: With Data Envelopment Analysis. European Journal of Purchasing & Supply Management, 8(3), 123-134.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. Academy of Management Review, 14(4), 532-550.

Ellram, L. M. (1995). Total Cost of Ownership: An Analysis Approach for Purchasing. International Journal of Physical Distribution & Logistics Management, 25(8), 4-23.

Ellram, L. M. & Siferd, S. P. (1998). Total Cost of Ownership: A Key Concept in Strategic Cost Management Decisions. Journal of Business Logistics, 19(1), 55-84.

Emiliani, M. L., Stec, D. J. & Grasso, L. P. (2005). Unintended Responses to a Traditional Purchasing Performance Metric. Supply Chain Management, 10(3), 150-156.

Eurostat. (2012). Short-Term Business Statistics. Retrieved 03.03.2012, from http://epp.eurostat.ec.europa.eu/portal/page/portal/short_term_business_statistics/introduction

Evans, J. (2004). An Exploratory Study of Performance Measurement Systems and Relationships with Performance Results. Journal of Operations Management, 22(3), 219-232.

Ewusi-Mensah, K. (1981). The External Organizational Environment and Its Impact on Management Information Systems. Accounting, Organizations and Society, 6(4), 301-316.

Fearon, H. E. & Bales, A. W. (1995). Purchasing of Nontraditional Goods and Services. Tempe, AZ: Center for Advanced Purchasing Studies.

Fearon, H. E., Dobler, D. W. & Killen, K. H. (1992). The Purchasing Handbook (5th ed.). New York: McGraw-Hill.

Fisher, C. & Downes, B. (2008). Performance Measurement and Metric Manipulation in the Public Sector. Business Ethics: A European Review, 17(3), 245-258.

Fisher, J. (1995). Contingency-based Research on Management Control Systems: Categorization by Level of Complexity. Journal of Accounting Literature, 14, 24-53.

Flowers, S. (2007). Organizational Capabilities and Technology Acquisition: Why Firms Know Less than They Buy. Industrial & Corporate Change, 16(3), 317-346.

Flyvbjerg, B. (2006). Five Misunderstandings about Case-Study Research. Qualitative Inquiry, 12(2), 219-245.

Fontana, A. & Frey, J. H. (2000). The Interview: From Structured Questions to Negotiated Text. In: N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of Qualitative Research (2nd ed., 645-672). Thousand Oaks, CA: Sage.

Franco, M. & Bourne, M. (2003). Factors That Play a Role in "Managing Through Measures". Management Decision, 41(8), 698-710.

Gelderman, C. J. & van Weele, A. J. (2005). Purchasing Portfolio Models: A Critique and Update. Journal of Supply Chain Management, 41(3), 19-28.

Gordon, L. & Narayanan, V. (1984). Management Accounting Systems, Perceived Environmental Uncertainty and Organization Structure: An Empirical Investigation. Accounting, Organizations and Society, 9(1), 33-33.

Govindarajan, V. (1984). Appropriateness of Accounting Data in Performance Evaluation: An Empirical Examination of Environmental Uncertainty as an Intervening Variable. Accounting, Organizations and Society, 9(2), 125-125.

Greca, I. M. & Moreira, M. A. (2000). Mental Models, Conceptual Models, and Modelling. International Journal of Science Education, 22(1), 1-11.

Hartmann, E., Entchelmeier, A., Henke, M. & Jahns, C. (2008). A Theory-based Framework for Integrated Supply Performance Measurement. In: D. Specht (Ed.), Strategische Bedeutung der Produktion: Tagungsband der Herbsttagung 2006 der Wissenschaftlichen Kommission Produktionswirtschaft im VHB (129-145). Wiesbaden: Dt. Univ.-Verl.

Hemmer, T. (1996). On the Design and Choice of "Modern" Management Accounting Measures. Journal of Management Accounting Research, 8, 87-116.

Hendrick, T. E. & Ruch, W. A. (1988). Determining Performance Appraisal Criteria For Buyers. Journal of Purchasing & Materials Management, 24(2), 18-26.

Holloway, J., Lewis, J. & Mallory, G. (1995). Performance Measurement and Evaluation. London, UK: Sage Publications.

Holmes, B. J. (1991). Lease-Buy Decision Analysis. International Journal of Purchasing & Materials Management, 27(4), 35-40.

Holmstrom, B. & Milgrom, P. (1991). Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design. Journal of Law, Economics, and Organization, 7, 24-52.

Ilgen, D. R., Mitchell, T. R. & Fredrickson, J. W. (1981). Poor Performers: Supervisors' and Subordinates' Responses. Organizational Behavior & Human Performance, 27(3), 386-410.

Jaworski, B. J. & Young, S. M. (1992). Dysfunctional Behavior and Management Control: An Empirical Study of Marketing Managers. Accounting, Organizations and Society, 17(1), 17-35.

Jensen, M. C. (2003). Paying People to Lie: The Truth about the Budgeting Process. European Financial Management, 9(3), 379-406.

Johnson, P. F. & Leenders, M. R. (2010). Minding the Supply Savings Gaps. MIT Sloan Management Review, 51(2), 25-31.

Johnston, W. J. & Bonoma, T. V. (1981). Purchase Process for Capital Equipment and Services. Industrial Marketing Management, 10(4), 253-264.

Knowlton Jr, W. A. & Mitchell, T. R. (1980). Effects of Causal Attributions on a Supervisor's Evaluation of Subordinate Performance. Journal of Applied Psychology, 65(4), 459-466.

Kumar, A., Ozdamar, L. & Chai Peng, N. (2005). Procurement Performance Measurement System in the Health Care Industry. International Journal of Health Care Quality Assurance, 18(2/3), 152-166.

Leenders, M. R., Johnson, P. F., Flynn, A. E. & Fearon, H. E. (2009). Purchasing Supply Management (13th ed.). New York, NY: McGraw-Hill Education.

Lipe, M. & Salterio, S. (2000). The Balanced Scorecard: Judgmental Effects of Common and Unique Performance Measures. The Accounting Review, 75(3), 283-298.

Love, P. E. D., Frani, Z. & Edwards, D. J. (2004). A Rework Reduction Model for Construction Projects. IEEE Transactions on Engineering Management, 51(4), 426-440.

Love, P. E. D. & Sohal, A., S. (2003). Capturing Rework Costs in Projects. Managerial Auditing Journal, 18(4), 329-339.

Mattson, M. & Salehi-Sangari, E. (1993). Making in Purchases of Equipment and Materials: A Four-country Comparison. International Journal of Physical Distribution & Logistics Management, 23(8), 16-30.

Maucher, D., Stölzle, W. & Hofmann, E. (2013). Erfolgsmessung beim Investitionsgütereinkauf – eine alleinige Frage der Savings (unpublished study).

Mayer, R. C. & Davis, J. H. (1999). The Effect of the Performance Appraisal System on Trust for Management: A Field Quasi-experiment. Journal of Applied Psychology, 84(1), 123-136.

Millar, M. G. & Millar, K. (1997). Effects of Situational Variables on Judgments About Deception and Detection Accuracy. Basic & Applied Social Psychology, 19(4), 401-410.

Monczka, R. M., Trent, R. J. & Handfield, R. B. (2002). Purchasing and Supply Chain Management (2nd ed.). Cincinatti, OH: South-Western College Pub.

Morssinkhof, S., Wouters, M. & Warlop, L. (2011). Effects of Providing Total Cost of Ownership Information on Attribute Weights in Purchasing Decisions. Journal of Purchasing & Supply Management, 17(2), 132-142.

Murphy, D., Pearson, J. & Siferd, S. (1996). Evaluating Performance of the Purchasing Department Using Data Envelopment Analysis. Journal of Business Logistics, 17(2), 77-91.

Newman, A. H. (2009). The Behavioral Effect of Cost Targets on Managerial Cost Reporting Honesty. Diss., Georgia State University, Atlanta.

Newman, R. G. & Simkins, R. J. (1998). Capital Equipment Buying Handbook. New York, NY: Amacom.

Nollet, J., Calvi, R., Audet, E. & Côté, M. (2008). When Excessive Cost Savings Measurement Drowns the Objectives. Journal of Purchasing & Supply Management, 14(2), 125-135.

Otley, D. T. (1980). The Contingency Theory of Management Accounting: Achievement and Prognosis. Accounting, Organizations and Society, 5(4), 413-428.

Pagell, M. & Das, A. (1996). Motivating the Purchasing Professional. International Journal of Purchasing & Materials Management, 32(3), 27-34.

Perry, J. H. (1987). A Conceptual Framework for Evaluating Capital Equipment Purchases. Journal of Purchasing & Materials Management, 23(4), 32-38.

Pfaff, D. & Pfeiffer, T. (2001). Controlling. In: P. J. Jost (Ed.), Die Prinzipal-Agenten-Theorie in der Betriebswirtschaftslehre (359-394). Stuttgart: Schäffer-Poeschel.

Pfeffer, J. & Sutton, R. I. (1999). The Knowing-Doing Gap: How Smart Companies Turn Knowledge into Action. Boston: Harvard Business School Press.

Quitt, A. (2010). Measuring Supply Management's Budget Effects: Introduction of Return on Spend as an Indicator of Supply Management's Financial Effectiveness. Diss., European Business School, Oestrich-Winkel.

Rich, V. (2007). Interpreting the Balanced Scorecard: An Investigation into Performance Analysis and Bias. Measuring Business Excellence, 11(1), 4-11.

Schiff, A. D. & Hoffman, L. R. (1996). An Exploration of the Use of Financial and Nonfinancial Measures of Performance by Executives in a Service Organization. Behavioral Research in Accounting, 8, 134-153.

Schnetzler, M. J., Sennheiser, A. & Schönsleben, P. (2007). A Decomposition-based Approach for the Development of a Supply Chain Strategy. International Journal of Production Economics, 105(1), 21-42.

Simons, R., Dávila, A. & Kaplan, R. S. (2000). Performance Measurement and Control Systems for Implementing Strategy. Upper Saddle River, NJ: Prentice Hall.

Slovic, P. & MacPhillamy, D. (1974). Dimensional Commensurability and Cue Utilization in Comparative Judgment. Organizational Behavior & Human Performance, 11(2), 172-194.

Smeltzer, L. R. & Manship, J. A. (2003). How Good Are Your Cost Reduction Measures? Supply Chain Management Review, 7(3), 28-33.

Steele, R. & Albright, C. (2004). Games Managers Play at Budget Time. MIT Sloan Management Review, 45(3), 81-84.

Talluri, S. (2002). Single Price System Model for Optimal Decisions in Capital Equipment Purchasing. International Journal of Production Research, 40(4), 1003-1016.

van de Ven, A. H. & Drazin, R. (1985). The Concept of Fit in Contingency Theory. In: L. L. Cummings & B. M. Staw (Eds.), Research in Organizational Behavior (333-365). Greenwich, CT: JAI Press.

Wagner, S. M. & Kaufmann, L. (2004). Overcoming the Main Barriers in Initiating and Using Purchasing-BSCs. Journal of Purchasing and Supply Management, 10(6), 269-281.

Waterhouse, J. H. & Tiessen, P. (1978). A Contingency Framework for Management Accounting Systems Research. Accounting, Organizations and Society, 3(1), 65-76.

Williams, K. J., DeNisi, A. S., Meglino, B. M. & Cafferty, T. P. (1986). Initial Decisions and Subsequent Performance Ratings. Journal of Applied Psychology, 71(2), 189-195.

Woodside, A. G. & Liukko, T. (1999). Organizational Buying of Capital Equipment Involving Persons across Several Authority Levels. Journal of Business & Industrial Marketing, 14(1), 30-48.

Wouters, M., Anderson, J. C. & Wynstra, F. (2005). The Adoption of Total Cost of Ownership for Sourcing Decisions: A Structural Equations Analysis. Accounting, Organizations and Society, 30(2), 167-191.

Yin, R. K. (2009). Case Study Research Design and Methods (4th ed.). Thousand Oaks, CA: Sage.

Appendix

Table A-6: Summary of the interviewees' function in the companies

Company	A	B	C	Total
Head of procurement		1		1
Central purchaser	1	2		3
Regional purchaser		1		1
Purchasing control		2	1	3
Total	1	6	1	8

Table A-7: Characteristics of the case companies

Company	A	B	C
Total spend	€ 0.8 bn.	€ 11.9 bn.	>€ 20 bn.
Environmental uncertainty	Medium	High	Low
Procurement status	Not represented in the company board	Low status in the company board	High status in the company board
Existence of a savings system or tool	Yes	No	Yes
Consideration of TCO in savings measurement for CEP	No	No	Partially
Consideration of leasing in savings measurement for CEP	Yes	Partially	Yes
Possibility of manipulation in savings measurement for CEP	Can happen	Can happen	Yes (several week spots)
Performance of capital equipment purchasing (self-assessment)	More successful than competitors	Equally successful than competitors	More successful than competitors

B. Contingency-based analysis of management control systems: The case of performance and savings measurement for capital equipment purchasing

B.1. Introduction

Models based on contingency theory are the prevalent logic for research on management control systems (MCS) (Dent, 1990). Contingency theory in MCS states that no general best practice MCS exist, which is suitable for all organizations in all situations, but an appropriate MCS depends on various contingent factors of an organization (Otley, 1980). For example, Covaleski, Dirsmith, & Samuel (1996) propose that "tight" MCS should be used in centralized organizations and "loose" MCS should be used in decentralized organizations.

The research on contingency-based MCS is quite comprehensive. According to Fisher (1995), contingent MCS studies can be classified according to their complexity level into four categories:

- First level: correlation of one contingent factor with one control mechanism (e.g., Macintosh & Daft, 1987).
- Second level: joint effect of one contingent factor and one control mechanism on an outcome variable, normally performance (e.g., Govindarajan & Gupta, 1985).
- Third level: joint effect of one contingent factor and multiple control mechanisms on an outcome variable, normally performance (e.g., Govindarajan & Fisher, 1990).
- Fourth level: joint effect of multiple contingent factors and multiple control mechanisms on an outcome variable, normally performance (e.g., Fisher & Govindarajan, 1993).

Several studies present contingency frameworks for MCS. For example, Otley (1980) reveals a framework in which contingent factors are perceived to be beyond the control of the organization. In order to adapt to these contingencies, organizations arrange the controllable factors into a promising configuration. However, the

organizational performance is influenced not only by the organizational control package, but also by contingent and other factors.

Fisher (1995) develops an iterative feedback loop MCS framework. In this framework, contingency factors directly selected by the organization (e.g., strategy) affect non-controllable contingency factors. These in turn influence the organizational control package (e.g., cybernetic control systems), which influences, together with all the other factors, the organizational outcomes (e.g., effectiveness and efficiency). The circle closes with the connection between measurements, as well as rewards and controllable contingency factors.

Chenhall (2003) provides a meta-analysis of findings from contingency MCS studies. For this purpose, he critically analyzes articles from 1983 to 2003 with reference to their contribution to the meaning and outcomes of MCS, and the contingent factors of external environment, technology, organizational structure, size, strategy, and national culture. Based on this analysis, he formulates 25 propositions about each contingent factor and critically evaluates the findings.

This analysis focuses on performance and savings measurement for capital equipment purchasing (CEP) as a special case of MCS. CEP involves all activities related to the acquisition of "tangible and intangible goods […] by organizations and that present the technical prerequisites for the production of goods and services (Hofmann et al., 2012, p. 10)." CEP is a significant matter in many companies and makes a fundamental contribution to procurement success. The percentage of the total purchase spend on capital equipment averages at about 13-16%. In addition to purchasing prices, which account for about 8-11% of the total purchase spend (CAPS Research, 2005; Fearon & Bales, 1995), related lifecycle costs (e.g., fuel, maintenance, repairs, and operating supplies) comprise about 5% of the total purchase spend (Fearon & Bales, 1995). Performance measurement's role in CEP is to gather, evaluate, and present all the relevant performance dimensions. Thereby, the monetary success of CEP, evaluated in savings measurement, is often the most important measure in companies. MCS involve all the activities, systems, and instruments to control the employee behavior in accordance with the company goals (Malmi & Brown, 2008). Thereby, performance measurement is the first step in the control loop. It delivers data for award systems, which in turn direct employee behavior.

A major challenge in corporate practice is adapting the design of performance and savings measurement for CEP to the relevant internal and external contingencies. For example, the requirements for the performance measurement system of large companies with large procurement organizations are different from those of smaller companies. According to contingency theory, the fit between an organization's situation (contingent factors) and its design of the performance and savings measurement system for CEP influences the performance in CEP. Therefore, companies should take these contingencies into consideration when selecting the relevant contingent factors and designing the performance and savings measurement system for CEP.

Performance and savings measurement for CEP has some special characteristics (e.g., consideration of buying centers) and faces certain special challenges (e.g., the definition of an appropriate reference price, consideration of TCO, manipulation, and missing trust). For that reason, the goal of the study is to examine how these characteristics and challenges influence contingency-based relationships in performance and savings measurement for CEP compared with general MCS. This topic has not been analyzed in the academic literature so far.

Based on the practical and academic relevance of contingency-based analysis for performance and savings measurement for CEP, the study attempts to answer the following research question (RQ): How do contingent factors influence performance and savings measurement for CEP and how do these relationships differ from MCS in general?

In the following, first a theoretical background to performance and savings measurement for capital equipment and a classification of the topic within the MCS research area is given. To answer the research questions, the methodology and the findings of the case study research (18 cases) are presented. Then, the findings are compared with Chenhall's (2003) propositions concerning MCS and external environment, technology, organizational structure, size, strategy, as well as culture. The paper closes with a summary, discussion of managerial implications, and outlook.

B.2. Performance and savings measurement for capital equipment purchasing as a specific case of management control systems

B.2.1. Classification of performance and savings measurement for capital equipment purchasing within management control systems

MCS are an essential element of successful business management (Simons, 1990). The concept of MCS, sometimes used interchangeably with management accounting systems and organizational controls, has evolved over the years. When the concept emerged, MCS were primarily regarded as a process to achieve the organization's objectives (Anthony, 1965; Ouchi, 1979). Later, various different definitions were developed, which mainly addressed the following characteristics: providing information (Alvesson & Kärreman, 2004; Lowe, 1971; Otley, 1999), providing feedback (Lowe, 1971; Merchant, 1985c), ensuring that companies adapt to the changing environment (Berry et al., 2005; Lowe, 1971), achieving goal congruence (Flamholtz, 1983; Lowe, 1971), and maintaining or altering patterns in organizational activity (Simons, 1990). In recent years, dealing with and directing employees' behavior have become the most-cited characteristic in MCS definitions (Alvesson & Kärreman, 2004; Malmi & Brown, 2008; Merchant & Van der Stede, 2007; Otley, 1999). In this sense, Malmi and Brown (2008, p. 290) define MCS as complete "systems, rules, practices, values and other activities management put in place in order to direct employee behavior."

In performance and savings measurement for CEP, as a specific case of MCS, the performance of specific CEP projects is measured by qualitative and quantitative measures. In the following, three different concepts of MCS will be presented to illustrate how performance and savings measurement for CEP can be classified within the broad field of MCS.

Merchant and van der Stede (2007) distinguish the management control objects results, action, personnel, and cultural controls. Results control refers to the results produced (e.g., earnings per share), action controls to actions taken (e.g., administrative constraints), personnel controls to employees (e.g., employee selection), and cultural controls to norms and values (e.g., codes of conduct). Results control, in which performance and savings measurement for CEP is located, encompasses defining

performance dimensions, measuring performance, setting performance targets, and providing rewards. In the field of management control, performance measurement is the most-researched topic (Davila, 2008). According to Neely, Gregory, & Platts (2005, p. 1229), performance measurement is "the process of quantifying the efficiency and effectiveness of action." In their definition, effectiveness describes the degree to which a certain goal is reached, while efficiency expresses the cost-benefit-ratio.

Otley (1999) develops a framework that structures MCS in subjects related to the key objectives, strategies, plans, processes, and activities to achieve the objectives, target-setting, incentive and reward structures, and information flows. In this framework, performance and savings measurement for CEP is part of the information flow. The information flow itself can be divided into feedback and feed-forward control. In feedback control, performance measures (e.g., savings) are compared with targets and, if necessary, countermeasures are launched. In feed-forward control, the need for actions is identified before negative effects are observed.

Malmi and Brown (2008) provide a typology for MCS consisting of five types of control: planning, cybernetic, reward and compensation, administrative, and cultural controls (Table B-1). In planning control, the goals and standards to be achieved and actions are formulated ex ante. In cybernetic control, performance is measured and compared with previously defined targets, unwanted deviations are reported, and the system can be adapted (Green & Welsh, 1988). Performance measurement for CEP covers financial measures, in which savings measurement for CEP pertains to, non-financial and hybrid measures. Reward and compensation systems attempt to motivate individuals and teams within organizations by achieving congruence between their targets and those of the organization, thus improving their performance (Bonner & Sprinkle, 2002). Administrative control systems influence employees' behavior through governance and organization structures as well as policies and procedures. Finally, cultural controls direct employees through the established subcultures (clans), values, and symbols within organizations.

As the three presented concepts show, performance and savings measurement for CEP can be classified based on the functions within the field of MCS. The next step in

classifying performance and savings measurement for CEP within the field of MCS is to define the scope and dimension of the measurement.

Table B-1: Management control systems package (Malmi & Brown, 2008)

<table>
<tr><td colspan="8">Cultural controls</td></tr>
<tr><td colspan="2">Clans</td><td colspan="3">Values</td><td colspan="3">Symbols</td></tr>
<tr><td colspan="2">Planning</td><td colspan="4">Cybernetic controls</td><td rowspan="2">Reward and compensation</td></tr>
<tr><td>Long-range planning</td><td>Action planning</td><td>Budget</td><td>Financial measurement systems</td><td>Non-financial measurement</td><td>Hybrid measurement systems</td></tr>
<tr><td colspan="8">Administrative controls</td></tr>
<tr><td colspan="2">Governance structure</td><td colspan="3">Organization structure</td><td colspan="3">Policies and procedures</td></tr>
</table>

The scope can be narrowed down through management functions. The basic management functions are product or service development, operations, marketing / sales, and finance (Merchant & Van der Stede, 2007); procurement is important to operations management. In procurement, the areas of measurement are: company, procurement function, procurement department, individual buyer, specific product line (or project), supply chain, supplier, and purchased item (Axelsson et al., 2002). Performance and savings measurement for CEP focuses on performance measurement of specific purchased items (capital equipment). Performance measurement of purchasing items can be conducted based on the quality, time, cost, and flexibility dimensions (Neely et al., 2005). Thereby, performance measurement for CEP encompassing all dimensions and savings measurement for CEP can primarily be allocated to cost measures, because different prices are compared.

B.2.2. Theoretical background of performance and savings measurement for capital equipment purchasing

Following the classification in MCS, some theoretical background of performance and savings measurement for CEP will be given. Performance measurement for CEP involves the evaluation of financial and non-financial performance dimensions for CEP (i.e. purchasing price, running costs, delivery time, quality, output, and safety).

Because of certain capital equipment and purchasing process characteristics, performance and savings measurement faces – among others – the following challenges:

- The involvement of many different departments and employees in CEP makes it difficult to designate successes.
- Because of the lengthy CEP process, scheduled budgets often change between the planning phase and the start-up.
- Capital equipment prices and delivery times often show high variability (Dobler et al., 1990), which should be considered in performance measurement.
- Because CEP is often associated with uncertain payment flows (Discenza & Gurney, 1990; Dobler et al., 1990; Leenders et al., 2009; Monczka et al., 2002; Perry, 1987) and high risks (Leenders et al., 2009), these circumstances should be considered in performance measurement.
- Long-term business relations and trust are important in CEP, but difficult to quantify within performance and savings measurement.

Between 90% and 95% of organizations apply savings measurement (CAPS Research, 2011; Quitt, 2010), and in most organizations, savings are the predominant measure of procurement performance (Dumond, 1994). Therefore, I have included a special focus on savings measurement for CEP in the analysis. Companies employ savings measurement mainly to communicate procurement performance, prove procurement achievements, and adjust and optimize budgets. Savings can be differentiated into hard and soft savings, referring to realized cost changes, as well as cost avoidance, referring to future cost changes (Dmytrenko, 1997; Nollet et al., 2008):

- Hard savings are easy-to-calculate monetary savings directly impacting on the bottom line, such as reductions in price, in staff, or in transaction costs (Dmytrenko, 1997; Nollet et al., 2008).
- Soft savings are non-monetary savings with an indirect, and difficult to calculate, impact on the bottom line, such as increases in productivity (Dmytrenko, 1997; Nollet et al., 2008).
- Cost avoidance implies the reduction or elimination of a possible future cost (Dmytrenko, 1997): for example, resisting or delaying an announced price increase from a supplier (Ashenbaum, 2006).

In corporate practice, various methods exist to calculate savings in different situations. However, all the methods compare the actual paid price with a determined reference price. The applied methods can be categorized by degrees of cost-effectiveness. Cost change measures compare the actual paid price of an item or service over a period of time (Monczka et al., 2002). Common examples of reference prices are previous paid prices and previous paid prices adjusted to market index developments (Monczka et al., 2002; Smeltzer & Manship, 2003). For cost avoidance measures, the reference price is a hypothetical price that might have occurred if the procurement had not taken specific action (Monczka et al., 2002; Smeltzer & Manship, 2003). Typical cost avoidance measures are: catalog prices, planned prices (e.g., budget), target prices, average bids, bids of the selected supplier, and prices paid by other plants, divisions, or business units (Monczka et al., 2002; Smeltzer & Manship, 2003). In CEP, some of these reference prices cannot be used. Because, in many cases, capital equipment is not purchased frequently, the most common savings measurement method – comparing actual paid prices with previous prices – is not applicable. Furthermore, capital equipment are often individualized products, so catalog prices are not available.

All the cost change and cost avoidance measures can also be calculated using the total cost of ownership (TCO), an accounting technique often used to support purchasing decisions (Ellram & Siferd, 1998; Wouters et al., 2005), instead of purchase price. The TCO includes all the costs relevant to the acquisition process (e.g., acquisition price, transaction, freight), possession (e.g., storage, interests), usage (e.g., energy, service), and disposal of a particular good (Ellram, 1995). For TCO calculation, non-monetary attributes have to be converted into monetary figures (Morssinkhof et al., 2011). Because a TCO calculation does not contain any comparative values to quantify the performance, it cannot serve directly as a performance measure in procurement. However, TCO information can provide a useful extension to one-dimensional reference prices in savings measurement. In CEP, the purchase price usually amounts to only 30-50% of the TCO (Leenders et al., 2009); thus, one must take into account possible follow-up costs in savings measurement for CEP.

In reporting, all the calculated savings can be reported in the actual year; the total savings can be distributed over the depreciation period of the capital equipment or they can be divided by the depreciation period and only reported in the actual year.

Savings measurement for CEP faces some special challenges in comparison with savings measurement for other goods and services. Maucher and Hofmann (2013) identify procedure- and behavior-specific challenges in savings measurement for CEP. Procedure-specific challenges are mainly associated with the savings calculation methods used, while behavior-specific challenges are related to the behavior of the persons involved. Procedure-specific challenges contain, for example, a definition of the correct reference price and consideration of the TCO, the benefits of capital equipment, as well as qualitative aspects (e.g., time, quality). Behavior-specific challenges concern topics such as manipulation, control, trust, and judgment in savings measurement for CEP. For example, it often happens that purchasers only book savings into the reporting system until they have reached their yearly target, because they fear being allocated a higher savings target for the next year if they exceed their actual target.

Following the classification explanation of performance and savings measurement for CEP, the next section will give an overview of the research methodology.

B.3. Research methodology

B.3.1. Research design

In the research, case studies are used to analyze contingencies in performance and savings measurement for CEP. In the academic literature, performance and savings measurement for CEP has not yet been explicitly analyzed. Case studies seem to be appropriate in this situation, because performance and savings measurement for CEP has not been analyzed in the academic literature so far (Eisenhardt, 1989), the relevant variables in this topic are not yet known in the literature (Dul & Hak, 2007), and the RQ is exploratory (Yin, 2009). Case studies are also the preferred method for the formulation of contingency-based propositions in unexplored relationships (Chenhall, 2003). The selected design is a multiple-case design and “performance and savings measurement for CEP within a company” serves as the single unit of analysis (Yin, 2009). The structure of the study is comparative, as the same case study was conducted several times and different descriptions of the same case are compared (Yin, 2009).

In the MCS literature there are three kinds of case studies (Atkinson & Shaffir, 1998):

1. case studies that provide a practice description;
2. case studies that test a theory developed elsewhere;
3. case studies that develop a theory.

In the research, the second type of case study (testing a theory) is applied. Therefore, the study has a deductive character. The findings of the case study analysis are compared with the 25 propositions formulated by Chenhall (2003). Thus, the general MCS propositions can be tested for the case of performance and savings measurement for CEP. Chenhall (2003) is selected for this comparison because of the broad literature basis and the large number of analyzed contingent areas. Table B-2 provides an overview of the measures applied to ensure validity and reliability in the study.

Table B-2: Measures applied to ensure validity and reliability in the case study research (based on Gibbert et al., 2008; Yin, 2009)

Type of validity / reliability	Measures applied
Construct validity (quality of operationalization for the concepts being studied)	• Multiple interviewers • Respondents verified the written interview transcripts • Adoption of constructs from previous studies (when available)
Internal validity (providing plausible causal arguments to defend the research conclusions)	• Research framework explicitly derived from the literature • Pattern matching • Triangulation of multiple data sources
External validity (defining a domain to which the findings can be generalized)	• Multiple case studies • Cross-case analysis • Different case studies within one organization (whenever possible) • Clear description of the case companies, context and situation
Reliability (enables subsequent researchers to obtain the same results if they repeat the procedures of the study)	• Case study protocol • Case study database (interview transcripts, further documents, audio records)

B.3.2. Case selection

Case selection can be the most important methodological decision in case study research (Dubois & Araujo, 2007). The case selection for the research is categorized in two levels (Holschbach & Hofmann, 2011):

1. the level of the company;
2. the level of the individual interviewee within the company.

On the company level, Eisenhardt (1989) suggests selecting extreme situations and contrasting cases that are likely to contribute to the emergent theory. To maximize the information utility, the cases in the research were selected in accordance with the variation strategy (Flyvbjerg, 2006). Thus, companies of different sizes, from different industries, with different levels of spending on capital equipment and different levels of professionalism in performance and savings measurement for CEP, were selected. The number of cases to be selected depends on the research design (Dul & Hak, 2007). Because 25 existing propositions shall be tested and the cases are selected by different variation variables, with 18 companies to analyze, a relatively large number of cases were chosen.

The second level concerns the selection of individual interviewees within the companies. In performance and savings measurement for CEP, employees from many different functions are involved, in either CEP, performance and savings measurement for CEP or both functions. On an individual level, the variation strategy was applied to obtain different views on the unit of analysis. Therefore, these company functions were involved in the interviews: chief executive officer (CEO), head of procurement, head of production (if responsible for CEP), purchaser, and employees from procurement management (if responsible for procurement controlling and procurement performance measurement). Furthermore, the interviewees were selected according to the "snowball" or "chain" principle, which means on the advice of people who know people within the company who know which cases are information rich (Miles & Huberman, 1994).

Table B-3 presents an overview of the analyzed organizations and their key characteristics concerning the company, procurement, and CEP. Table B-4 shows a summary of the interviewees' function within the companies. In order to retain anonymity, each company was given a company label.

B.3.3. Data collection

During the data collection, multiple methods were combined to attain triangulation (McCutcheon & Meredith, 1993). The main data collection method was semi-structured interviews (Fontana & Frey, 2000; Rubin & Rubin, 1995) using an interview guideline consisting of six sections on the following topics: procurement

organization, procurement performance measurement, general savings measurement, savings measurement for CEP, examples of savings measurement for CEP, and statistical information (Table B-5). In most cases, the interviews were carried out face to face and recorded on tape (unless the interviewee disagreed) in order to ensure an accurate rendition of the conversation (Voss et al., 2002). The respondents were asked to verify the written transcripts of the interviews. In total, 24 interviews were conducted with 32 respondents from 18 different companies from summer 2011 to spring 2012 in Germany, Switzerland, and the U.S. The interviews lasted from 1.5 to 3 hours each. To increase the confidence in the findings, each interview was conducted by two researchers (Eisenhardt, 1989) and the interviewees were assured that the results would be published anonymously.

Financial information about the companies was retrieved from official financial statements. In addition, further internal company documents on the interview guideline topics were analyzed (e.g., organization charts, guidelines to calculate savings, and sample calculations).

B.3.4. Data analysis

The transcription of the interviews resulted in more than 350 pages of textual material. To analyze the transcripts and further documents, the steps for qualitative data analysis proposed by Miles and Huberman (1994) – consisting of data reduction, data display, and conclusion drawing / verification – were applied.

First, each transcript was read several times to refresh the understanding of the cases. For data reduction purposes, coding was applied to the transcripts and all the other data. Codes are tags for assigning units of meaning to the information gathered during a study (Miles & Huberman, 1994). Coding was conducted according to a two-stage approach with open and axial coding (Corbin & Strauss, 1990). In open coding, in the first step, the main terms were extracted from the original data. Therefore, each relevant statement was allocated to a research construct. Finally, in axial coding, the open codes were summarized to allow a detailed analysis. In this process, each term was allocated to comparable characteristics.

The next step included an attempt to arrange the coded data clearly for a cross-case analysis. In the cross-case analysis, similarities, differences, and patterns were traced

across different cases. Then, the coded data were transferred into a large "case-ordered descriptive meta-matrix," in which the data were arrayed case by case and according to the variables of interest (Miles & Huberman, 1994). In most cases, the variables of interest correspond to single interview questions.

The final step involved the comparison and testing of the propositions formulated by Chenhall (2003) with the results of the research on performance and savings measurement for CEP. To test each proposition, the relevant variables were compared with each other in an aggregated form. The coded date made up the basis for this analysis, but in case of doubt, the original data were also taken into account.

B.4. Description and discussion of the findings

In this section, the research findings on performance and savings measurement for CEP are presented and compared with the propositions formulated by Chenhall (2003). The findings will be discussed in accordance with the propositions' initial structure: MCS and the external environment (section B.4.1), generic concepts of technology (section B.4.2), advanced technologies (section B.4.3), organizational structure (section B.4.4), size (section B.4.5), strategy (section B.4.6), and culture (section B.4.7).

B.4.1. Propositions concerning the external environment and management control systems

In the following, propositions on the external environment and MCS will be tested and discussed as they pertain to performance and savings measurement for CEP. In the study, the construct uncertainty of the external environment was measured by sales developments for each industry according to the statistical classification of economic activities in the European Community (NACE). Negative percentage changes in sales development by industries in the European Union from 2001 to 2010 were calculated for each year (Eurostat, 2012). Companies belonging to an industry with a high sum of negative percentage changes in sales development were associated with an uncertain external environment, because they often have to react to negative business cycle developments. This construct was selected as it can be calculated objectively for each industry and adequately represents environmental uncertainty. This understanding of

the construct uncertainty of the external environment will be used for the following propositions.

Proposition 1: The more uncertain the external environment the more open and externally focused the MCS.

Chenhall (2003) relates an open MCS to the use of broad-scope information and non-financial, informal, and subjective information. In savings measurement for CEP, there is no relation between external environmental uncertainty and openness of the measurement system (e.g., usage of broad-scope as well as non-financial procurement performance measures or a savings guideline). However, the study shows that companies in an uncertain environment have a higher material ratio, i.e. share of purchasing volume in relation to sales. The reason for this phenomenon might be that companies in an uncertain environment try to protect themselves through a high degree of outsourcing in order to make their production more flexible. In the case of a higher material ratio, MCS are also more externally focused to measure internal procurement performance as well as suppliers and their relations to them. This partially confirms the proposition.

Proposition 2: The more hostile and turbulent the external environment the greater the reliance on formal controls and an emphasis on traditional budgets.

A hostile and turbulent environment also refers to negative changes in sales development in the analysis. Formal controls in procurement performance measurement involve the usage of special methods and instruments (e.g., purchasing balanced scorecard, IT and ratio systems) and the use of a savings guideline (a company-specific document, which defines different kinds of savings and explains the process of capturing, calculating, and reporting the savings). In the study, there is no connection between environmental uncertainty and the usage of special methods and instruments or a savings guideline.

However, general procurement performance measurement is more important for companies in an uncertain environment, which means that formal controls are more significant in this situation. An explanation for this relationship might be that a non-controllable environment necessitates the control of the internal purchasing processes.

The analysis reveals the methods used in corporate practice to calculate savings for CEP. If there is no historical or catalog price available, savings for CEP are commonly calculated as the difference between:

- the initial and final offer from the selected supplier (price quotation method under consideration of one single initial offer);
- the offer after the technical discussion and the final negotiated price with the selected supplier (price quotation method under consideration of one single technically validated offer);
- the average of the n (e.g., three) best offers that are technically in order and the final price (price quotation method under consideration of several offers);
- the lowest final offer of an established supplier and the lowest final offer of a new supplier (price quotation method under consideration of established suppliers);
- the budget and final offer from the selected supplier (budget comparison method);
- the calculated value and negotiated price (value analysis approach). To determine the calculated value of capital equipment, an individual reference price for each major component is determined. The reference price for components can be historical prices, adapted historical prices, or estimations.

The emphasis on traditional budgets can be compared with the application of the BCM in savings measurement for CEP. However, the opposite effect occurs, i.e., companies in a certain environment are more likely to use the budget comparison method. The reason for this behavior could be that the budget comparison method is often seen as a more objective performance measure and is therefore considered the most appropriate method in uncertain situations.

The analyzed proposition is therefore not true for the case of performance and savings measurement for CEP and can be rewritten as follows: *The more hostile and turbulent the external environment, the more important is procurement performance measurement*.

Proposition 3: *Where MCS focused on tight financial controls are used in uncertain external environments they will be used together with an emphasis on flexible, interpersonal interactions.*

In procurement, a wide range of financial and non-financial performance measures and dimensions are used. In the study, the following measures and dimensions were applied by the case companies:

- Hard savings, soft savings, cost avoidance
- Costs of the procurement organization
- Quality of the goods and services
- Availability of the goods and services
- Supplier evaluation
- Satisfaction of internal customers
- Automation degree of the purchasing process
- Ratio of delegated purchasing volume to departments other than procurement
- Competition ratio of a particular purchasing process
- Comparison of project progress with project schedule
- Purchasing volume awarded through tenders
- Framework agreement usage
- Share of small orders

Under these measures and dimensions, savings as well as cost avoidance, the costs of the procurement organization, and the purchasing volume awarded through tenders are mainly used as financial measures. In the analysis, company systems with above-average usage of financial measures in procurement performance measurement are regarded as being focused on tight financial controls. In the study, six companies (MF3, MF6, MF8, SE2, SE3, and SE4) are identified as having an above-average uncertain environment along with a focus on financial measures. In the following, these companies will be compared with the rest of the case companies.

An emphasis on flexible and interpersonal interactions in procurement performance measurement can be evaluated through the use of participative budgeting, non-application of a savings guideline and manipulation in savings measurement for CEP. Participative budgeting is a process in which functional company departments, e.g., procurement, are involved in the budgeting process and are able to influence the determination of their budget (Shields & Shields, 1998). In the study, four of the uncertain and financially focused companies use participative budgeting and only one

company does not. Among those remaining companies, six use participative budgeting and five do not (two companies failed to provide any information). Thus, the percentage of companies using participative budgeting is much higher for uncertain and financially focused companies. An explanation for this behavior could be that in an uncertain situation, employees try to spread the risk and involve more departments in the budgeting process.

According to Chenhall (2003), financial controls are used together with flexible instruments in an uncertain environment. Thus, I expect the uncertain and financially focused companies to waive the usage of a savings guideline, which specifies how to measure savings. This proposition is supported by the analysis. Four out of five of the uncertain and financially focused companies do not use a savings guideline, compared with five out of nine of the rest that use this instrument (four companies did not provide any information). Even though the six selected companies have a strong focus on financial measures, they do not use a formal guideline to structure and concretize these measures. It seems that they try to remain flexible because of their uncertain environment.

Furthermore, Chenhall (2003) states that environmental uncertainty is linked to the manipulation of performance measures (Merchant, 1990). Manipulation is also a major challenge in savings measurement, especially in CEP (Emiliani et al., 2005; Maucher & Hofmann, 2013). Examples of savings measurement manipulation for CEP include instances in which purchasers ask potential suppliers for a higher first offer to improve their negotiation success or in which purchasers only report savings until they have reached their yearly targets, because they fear being allocated a higher target for the following year (Maucher & Hofmann, 2013). When examining savings measurement for CEP, the opposite of Chenhall's (2003) proposition were found to be true. While the majority of the uncertain and financially focused companies stated that manipulation is not a problem in their company, the majority of the remaining companies reported that manipulation could happen in their company.

The study mostly supports Chenhall's (2003) proposition concerning the combination of environmental uncertainty and a focus on financial measures. The study only reveals a different result in the cases of manipulation, which is a difficult topic to analyze through interviews.

B.4.2. Propositions concerning generic concepts of technology and management control systems

In this section, Chenhall's (2003) propositions concerning generic concepts of technology (such as complexity, task uncertainty, and interdependence) and MCS will be examined and discussed with reference to the focus of the study. Technology complexity describes "the extent to which the production process is controllable and its results predictable" (Woodward, 1958, p. 12) and increases from unit and batch production, to mass production, to continuous process production. Task uncertainty is conceptualized by task analyzability, the extent to which tasks can be reduced to well-known procedures, and task variety, the frequency of unexpected and novel events in the task (Perrow, 1974). Interdependence refers to the degree of contingencies and coordination difficulty (Thompson, 1967).

Proposition 4: *The more technologies are characterized by standardized and automated processes the more formal the controls including a reliance on process control, and traditional budgets with less budgetary slack.*

To classify case companies according to the degree of standardized and automated processes, the production and service processes of each company were analyzed. The focus on formal controls was conceptualized by the usage of financial performance measures, the usage of special methods and instruments (e.g., purchasing balanced scorecard, IT and ratio systems), the usage of a savings guideline, and the application of the budget comparison method to calculate savings for CEP.

Companies with highly standardized and automated processes have a 26% share of financial measures, compared with 19% (24%) for companies with a low (medium) standardization degree. It seems that companies with standardized and automated processes favor financial measures because they do not necessarily need the broader view of financial and non-financial measures in their situation. Furthermore, the higher the standardization and automation of the processes, the more often a savings guideline is used. However, the usage of special methods and instruments and the application of the budget comparison method are not related to standardization and automation.

Compared with the purchasing process of other purchasing groups (e.g., regularly procured production material), CEP is often a highly complex task with a low degree of standardization and automation. Budgetary slack refers to the excess of the planned budget over the actual necessary budget (Merchant, 1985a). The study shows that budgetary slack is also a major challenge in savings measurement for CEP. Especially when applying the budget comparison method, specialty departments try to receive higher budgets in order to be able to report higher savings. This occurs mainly because of low standardization in CEP and a lack of historical experience; therefore, budgetary slack is easier to attain for specialty departments. One way of reducing budgetary slack is to use CEP budgets for sales. The interviewee from company MF5 stated that when this occurs, "one cannot simply enforce a higher budget for sales, or else we would not sell anything on the market any longer." To summarize the findings, Chenhall's (2003) proposition concerning standardized and automated processes is only partially true in the field of savings measurement for CEP.

Proposition 5: *The more technologies are characterized by high levels of task uncertainty the more informal the controls including: less reliance on standard operating procedures, programmes and plans, accounting performance measures, behaviour controls; higher participation in budgeting; more personal controls, clan controls, and usefulness of broad scope MCS.*

CEP is often associated with high financial stakes (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002; Talluri, 2002), long capital commitment, uncertain payment flows (Discenza & Gurney, 1990; Dobler et al., 1990; Leenders et al., 2009; Monczka et al., 2002; Perry, 1987), high variability of prices and delivery times (Dobler et al., 1990), high risks (Leenders et al., 2009), and high rates of technological obsolescence. For these reasons, CEP faces higher task uncertainty than many other purchasing groups. The study reveals that performance measurement for CEP is often more informal than for other purchasing groups:

- CEP performance dimensions differ from case to case and sometimes also within a company.
- There is no standardized method to calculate savings.

- In some companies, capital equipment is the only purchasing group not to be included in the aggregated savings calculation. A procurement manager responsible for performance measurement in company MF1 stated that "capital equipment savings are excluded from the benefit calculation because there is no market price for capital equipment available."

Therefore, Chenhall's (2003) proposition concerning task uncertainty is supported by CEP.

Proposition 6: *The more technologies are characterized by high levels of interdependence the more informal the controls including: fewer statistical operating procedures; more statistical planning reports and informal coordination; less emphasis on budgets and more frequent interactions between subordinates and superiors; greater usefulness of aggregated and integrated MCS.*

In many cases, new capital equipment must be integrated into an existing environment; interdependences with existing capital equipment must be considered (Discenza & Gurney, 1990; Perry, 1987). If an airline, for example, wants to purchase a new airplane, it has to consider that a switch to a new supplier would lead to additional maintenance and coordination costs because of the necessity of new tools, know how, etc. Thus, it can be stated that CEP is associated with high levels of interdependence compared with other purchasing groups. As already shown in proposition 5, performance measurement for CEP tends to be more informal (e.g., no standardized performance dimensions and savings methods) than for other purchasing groups. The proposition on interdependence is also true for the subject of the analysis.

B.4.3. Propositions concerning advanced technologies and management control systems

In this section, propositions concerning advanced technologies as context variables of savings measurement for CEP will be analyzed. Chenhall's (2003) propositions concerning Total Quality Management, Just in Time, Flexible Manufacturing and Flexible Manufacturing Systems will not be analyzed because these technologies are not applied in CEP.

Proposition 7: *The extent to which combinations of advanced technologies and non-financial performance measures are associated with enhanced performance depends on the degree to which the measures are used as part of reward and compensation schemes.*

A major advanced technology in CEP is the TCO calculation. Although this calculation should be obligatory in CEP, some companies still do not use it. In the analysis, five companies (MF1, MF4, MF7, SE1, and CT2) were found that combine the TCO calculation with an above-average usage of non-financial performance measures. CEP performance was measured by self-evaluation of the interviewees in five categories: price performance, quality performance, in-time delivery performance, satisfaction of internal customers, and total performance. Further, the companies were asked whether they have an incentive system for the procurement department depending on the procurement performance measures. For the five companies that combined the TCO calculation with the usage of non-financial performance measures, no relation between the usage of an incentive system and the CEP performance was found. The proposition is therefore not true for CEP performance measurement.

Instead, the study revealed that small companies – as well as small und unprofessional procurement departments – prefer a performance-linked payment, as opposed to larger companies or larger procurement departments. Interviewees desiring a performance-linked payment believe that savings measurement for CEP has a positive influence on CEP performance. Accordingly, an interviewee from company MF1 stated: “Of course, I think an incentive will increase motivation and, at the end, I would say the savings will be higher, because I think that is how human beings behave. There is a higher reward, so there is a higher outcome.” A reason for this attitude might be that employees in smaller companies think that they can actually influence performance measures through their personal performance, whereas in larger companies many influencing variables on procurement performance measures exist.

According to the analysis, the proposition can therefore be reformulated for MSC in procurement: *Small organizations are associated with a preference for performance-linked payment in procurement.*

Proposition 8: *Supplier partnership practices are associated with non-financial measures, informal meetings and interactions across the value chain.*

A common supplier partnership in CEP is performance contracting. The main idea in performance contracting is to define the performance outcomes (expected value for the customer) instead of inputs, resources, activities, or processes (Selviaridis, 2011). In CEP buying, companies do not acquire single goods (e.g., capital equipment, spare parts) and services (e.g., repairs) but, for example, a specified level of availability. The supplier's compensation in this concept is based on the fulfillment of these outcomes (Kim et al., 2007).

In the study, none of the companies that apply performance contracting in CEP use savings measurement, as a financial measure, to evaluate the buying decision. Instead, the key performance indicators (KPIs) relevant to the compensation are measured and discussed with suppliers.

Concerning savings measurement for CEP, the findings support the proposition on supplier partnership practices.

B.4.4. Propositions related to organizational structure and management control systems

In this section, Chenhall's (2003) propositions on organizational structure and MCS will be compared with performance and savings measurement for CEP. The organizational structure can be defined "as the formal allocation of work roles and the administrative mechanisms to control and integrate work activities including those which cross formal organizational boundaries" (Child, 1972, p. 2). In his propositions on organizational structure, Chenhall (2003) addresses topics such as different departments, decentralization, as well as team and organic structures.

Proposition 9: *Large organizations with sophisticated technologies and high diversity that have more decentralized structures are associated with more formal, traditional MCS (e.g., budgets, formal communications).*

In the analysis, large organizations are more often associated with sophisticated technologies and decentralized structures. While companies with a centralized procurement organization generate € 2.1 bn. sales on average, companies with a decentralized (hybrid) procurement organization generate € 30.7 bn. (€ 28.9 bn.). Large organizations also employ sophisticated technologies more often. Furthermore,

companies applying TCO calculation have average sales (purchasing volume) of € 23.6 bn. (€ 11.9 bn.), whereas companies applying only partial TCO calculation have average sales (purchasing volume) of € 3.0 bn. (€ 1.6 bn.).

Formal and traditional MCS in procurement performance measurement involve the usage of financial performance measures, special methods and instruments (e.g., purchasing balanced scorecard, IT and ratio systems), the use of a savings guideline, and the application of the budget comparison method to calculate savings for CEP. Larger case companies use financial performance measures more often. In the study, the companies were classified by sales as small (less than € 1 bn.), medium (€ 1-10 bn.), and large (more than € 10 bn.) companies. In small companies, 17% of the procurement performance measures are financial measures, compared with 25% in medium and 26% in large companies. Looking at purchasing volume, the same phenomenon was observed. Financial measures in companies with a small purchasing volume (less than € 1 bn.) add up to 20%, compared with 24% in companies with a medium purchasing volume (€ 1-10 bn.) and 26% in companies with a large purchasing volume (more than € 10 bn.).

Larger companies also use more special procurement performance methods and instruments, such as purchasing balanced scorecards, special IT systems, ratio systems, etc. With regard to sales, small companies use, on average, 1.2 special procurement performance methods and instruments, compared with 1.9 in medium and 2.3 in large companies. When analyzing purchasing volume, the same result appears. Companies with a small purchasing volume use, on average, 1.4 methods and instruments, companies with a medium purchasing volume 1.8, and companies with a large purchasing volume 2.3 methods and instruments.

Furthermore, larger companies use formal savings guidelines more often. The average sales for companies with a savings guideline are € 44.5 bn, whereas companies without a savings guideline average only € 11.6 bn. sales. The average purchasing volume for companies with a savings guideline is € 25.6 bn, compared with € 2.2 bn. for companies without a savings guideline.

To measure savings for CEP, most companies use either the budget comparison method or the price quotation method. Larger companies also rely more on budgets, preferring the budget comparison method. Companies applying the budget comparison

method have average sales of € 39.9 bn. and an average purchasing volume of € 21.1 bn; companies using the price quotation method have sales of € 23.9 bn. and a purchasing volume of € 14.8 bn.

To sum up, all the findings fully support Chenhall's (2003) proposition on large companies with sophisticated technologies and decentralized structures. Because larger companies have more resources, it is not surprising that these companies use a wider range of methods, instruments, and guidelines for procurement performance measurement. In support of this explanation, the interviewee from company MF2 stated that "finally, the cost [for procurement performance measurement] is far too great for us because we are just a small company." The focus on financial performance measures and budgets can be explained by the fact that larger companies are often more financially driven and have to report more financial figures than smaller companies (Salamon & Dhaliwal, 1980).

Proposition 10: Research and development departments compared to marketing departments, which face higher levels of task uncertainty, are associated with participative budgeting; and marketing compared to production departments, which face higher levels of external environmental uncertainty, are associated with more open, informal MCS.

The research did not compare different company functions, but analyzed task and environmental uncertainty in CEP. As already shown in proposition 5, CEP faces higher task uncertainty than many other purchasing groups. In the study, the budgeting process for CEP is carried out by different company functions:

- Accounting: CP2, CT2, SE1
- Management: MF1, MF6, MF7
- Specialty department and accounting: MF8
- Specialty department and sales department: MF5
- Specialty department and management: CP1, CT1, MF2, MF4, SE2, SE3, SE4
- Management and accounting: SE6

For CEP, an undertaking involving high task uncertainty, ten companies in the study apply participative budgeting and only six do not (two companies failed to provide any information). The proposition is thus supported for CEP.

CEP is also often related to high environmental uncertainty, because the capital equipment industry is very sensitive to business cycles, leading to high variability of capital equipment prices and delivery times (Dobler et al., 1990). Furthermore, the rate of technological obsolescence for capital equipment can vary widely, which complicates the question of optimal replacement time. As already shown in proposition 5, performance measurement for CEP is often rather informal (e.g., no standardized performance dimensions and savings methods). Generally, performance measurement for CEP also has a broad scope of performance measures. Apart from savings, delivery time, quality, and safety are also examples of important measures. Based on these considerations, the proposition on environmental uncertainty can be supported.

Proposition 11: The structural characteristics of functional differentiation based on research and development compared to marketing, leadership style characterized by a consideration compared to initiating style, and higher levels of decentralization are associated with participative budgeting.

Because CEP involves many different departments and employees, the leadership style varies widely within the case companies and was therefore not considered in the research. Regarding the organizational structure of the procurement departments, centralized, hybrid, and decentralized procurement functions were distinguished (CAPS Research, 2005). The research revealed no relation between the organizational structure of the procurement department and participative budgeting. In centralized procurement functions, three of five case companies applied participative budgeting, compared with five of eight in hybrid and two of three in decentralized procurement functions. Because CEP often involves many different company functions, it seems that in centralized and semi-centralized structures budgeting is also conducted by several departments. Thus, the proposition does not hold true for CEP, at least in the area of decentralization.

The proposition therefore needs to be rewritten for the case of procurement: *The more departments are involved in a procurement task, the more often participative budgeting is applied.*

Proposition 12: Decentralization is associated with the MCS characteristics of aggregation and integration.

Aggregation and integration are important dimensions of MCS (Bouwens & Abernethy, 2000; Chenhall & Morris, 1986; Gordon & Miller, 1976; Mia & Goyal, 1991). Through aggregation, information is summarized by functional areas (e.g., procurement function), organizational units (e.g., procurement department), areas of interest (e.g., CEP), or time periods (e.g., day, month, year) and can, for example, be used for decision models (Bouwens & Abernethy, 2000; Chenhall & Morris, 1986). Integration means that MCS include information about the actions of other organizational units within the company; information about how decisions are made in one organizational unit may influence other organizational units (Bouwens & Abernethy, 2000).

In performance measurement for CEP, ratio systems are used to aggregate information into KPIs. The study revealed no relation between the procurement's organizational structure and ratio systems usage for CEP. While in centralized procurement departments three of five companies use ratio systems, three of nine companies in hybrid organizations and one of three companies in decentralized procurement departments use these systems. With regard to aggregation, the findings do not support the analyzed proposition.

Integration in performance measurement for CEP can be conceptualized as the integration of savings measurement in an Enterprise Resource Planning (ERP) system in which all the procurement functions report their information. In centralized purchasing functions, three of five integrate savings into their ERP system, compared with three of nine in hybrid and zero of three in decentralized structures. Observing integration, Chenhall's (2003) proposition was found to be inaccurate.

However, concerning decentralization a higher usage of financial measures (centralized 21%, hybrid 23%, decentralized 25%), the involvement of more procurement groups (production material, supplies, capital goods, services and trading goods; centralized 3.9, hybrid 4.3, decentralized 5.0), and a higher level of usage of

methods and instruments for purchasing performance measurement (centralized 1.8, hybrid 1.9, decentralized 2.0) were found. For CEP performance measurement the proposition can be adapted as follows: *Decentralization is associated with greater usage of financial measures and a higher degree of diversified operations as well as technologies.*

Proposition 13: Team based structures are associated with participation and comprehensive performance measures used for compensation.

The degree of team-based structures in CEP can be measured using the purchasing department's involvement in the buying process. The CEP process consists of 14 steps: demand assessment, specification of requirements, procurement market research, request for quotation, preliminary selection of quotations, award negotiations, award decision, contract drafting and ordering, order monitoring, monitoring delivery and release, organization of start-up and test operation, delivery acceptance, support of maintenance and repair, and disinvestment (Hofmann et al., 2012). To measure the purchasing department's involvement in CEP, the involvement's mean value of all the steps was calculated.

Participative budgeting will be used in the study to measure participation in performance measurement. However, in the analysis, case companies applying participative budgeting have an average involvement of 34% in CEP, compared with 40% for the remaining companies. Thus, this aspect of the proposition is not supported by the findings.

Furthermore, the study analyzed whether companies have a compensation system that considers performance measures. In most companies, the usage of performance-linked payment increases with the hierarchy level. Employees often receive a base salary and a bonus depending on the achievement of individual objectives. In practice, the broad scale for employee evaluation is often used only in a very narrow range. One interviewee stated that "the problem is that I have to take away somebody's bonus, in order to be able to give it to somebody else." The compensation systems were classified into two categories: partial, if a performance-based bonus is only given to higher hierarchy levels, and comprehensive, if all purchasing employees can receive a bonus. In the study, purchasing's involvement in CEP in companies without a performance-based compensation system is much lower (23%) than in companies with

a partial (46%) or comprehensive (39%) performance-based compensation system. In the area of compensation, the findings support Chenhall's (2003) proposition.

Proposition 14: Organic organizational structures are associated with perceptions that future orientated MCS are more useful, and with the effective implementation of activity analysis and activity-cost analysis.

MCS can be grouped into organic and mechanistic forms. Organic systems are associated with flexibility, responsiveness, few rules, standardized procedures, and data richness (Chenhall, 2003). The characteristics of organic systems are, for example, competitor-focused accounting (Guilding, 1999), task forces and meetings (Abernethy & Lillis, 1995), as well as budgetary slack (Dunk, 1993). Mechanistic systems refer to formal rules and standardized procedures (Chenhall, 2003). Distinctive of mechanistic systems are, for example, process controls (Merchant, 1985b), output and results controls (Macintosh & Quattrone, 2010), and budget controls (Rockness & Shields, 1984). Based on the described criteria, CEP performance measurement systems were classified into these two categories.

Future-oriented MCS are conceptualized in the study through the consideration of future benefits in savings measurement for CEP. Often, in savings measurement for CEP, costs are considered, but not the benefits of capital equipment, such as efficiency and productivity. Comparing mechanistic and organic systems, no significant difference in considering benefits in savings measurement for CEP was found. The proposition does not hold for this point. The implementation of activity analysis and activity-cost analysis is not applied in performance measurement for CEP by the case companies and therefore was not analyzed in the study.

Instead, companies with mechanistic MCS use more purchasing performance methods and instruments (mechanistic: 2.1; organic: 1.2) and use savings guidelines more often (mechanistic: 6 of 9; organic: 0 of 5; 4 companies did not provide any information). Therefore, concerning organic and mechanistic MSC the following proposition can be derived: *Mechanistic organizational structures are associated with more formal purchasing performance measurement systems.*

B.4.5. Propositions concerning size and management control systems

In this section, Chenhall's (2003) proposition about organizations' size is analyzed with regard to performance and savings measurement for CEP. Concerning MCS, the topics in this section are, for example, formalization, divisionalization, and participation.

Proposition 15: Large organizations are associated with more diversified operations, formalization of procedures and specialization of functions.

In the analysis, large organizations are determined by sales. The degree of diversified operations is conceptualized by the number of different procurement groups that are considered in procurement performance measurement. Concerning diversification, the results of the analysis confirm the proposition. On average, 2.7 different procurement groups are included in procurement performance measurement in small companies, compared with 4.9 in medium and 5.0 in large companies.

A main tool for formalizing procedures in CEP is the distinction between technical and commercial evaluation. In this concept, the technical department receives separate offers containing only technical information without commercial data. The technical department must evaluate the technical aspects of each offer and give a monetary bonus or malus. Subsequently, the commercial department integrates the bonus or malus into its overall evaluation. The distinction between technical and commercial evaluation is often made by larger companies. Companies using this concept have average sales of € 80.8 bn. compared with € 14.2 bn. for companies that do not apply this concept. Based on these findings, the study supports the proposition in the area of formalization.

Furthermore, more specialized functions in larger organizations were expected. Therefore, the study analyzed whether larger companies prefer organizational separation of CEP from other purchasing groups (e.g., a separate procurement team). The findings also support this part of the proposition. While companies that do not separate CEP from other purchasing groups have average sales of € 5.3 bn., companies with partial separation exhibit sales of € 12.8 bn. and companies with full separation have average sales of € 36.8 bn.

The proposition is therefore supported in each aspect and is also supported when analyzing the purchasing volume instead of the sales.

Proposition 16: Large organizations are associated with more divisionalized organizational structures.

In the study divisionalized organizational structures in performance measurement for CEP were conceptualized by a separate department responsible for procurement management control and performance measurement. If such a department exists, it is usually responsible for the CEP performance measurement methods, processes, and guidelines. In the analysis, companies with a procurement management control and performance measurement department have average sales of € 36.9 bn. and companies without this department have average sales of € 18.1 bn. For that reason, the proposition completely applies to performance measurement for CEP.

Proposition 17: Large size is associated with an emphasis on and participation in budgets and sophisticated controls.

First, it was analyzed whether a relation exists between the company size (sales) and use of participative budgeting for CEP. In the case study, companies that apply participative budgeting for CEP have average sales of € 24.3 bn. compared with € 19.9 bn. for companies that do not apply this method. For participation in budgets, the proposition can therefore be confirmed.

Next, sophisticated controls in performance measurement for CEP were analyzed. To examine sophisticated controls, the degree of professionalism for performance measurement for CEP, savings measurement in general, and savings measurement for CEP was determined. To determine the degree of professionalism for CEP performance measurement, the involvement of performance measurement dimensions and KPIs (e.g., savings, costs of the procurement organization, quality, and satisfaction of internal customers), purchasing groups, and methods and instruments used (e.g., purchasing balanced scorecard) were considered.

For savings measurement professionalism, the following criteria were considered: distinction of different kinds of savings, involvement of different purchasing groups, savings tools, reporting of negative savings, and the use of savings measurement results. In assessing savings measurement for CEP, the following topics were studied:

proportionate value of purchased capital equipment with calculated savings, consideration of TCO in savings measurement for CEP, application of savings measurement for leasing and performance contracting, existence of a savings guideline for CEP, and consideration of capital equipment benefits in savings measurement.

The study revealed that large companies are much more professional in all three categories (performance measurement for CEP, savings measurement in general, and savings measurement for CEP) than small companies, which fully supports the proposition.

B.4.6. Propositions concerning strategy and management control systems

In this section, Chenhall's (2003) propositions concerning strategy will be compared with the findings on procurement performance measurement for CEP. The study analyzed case companies according to the strategy classification proposed by Covin and Slevin (1989), Gupta and Govindarajan (1984), Miles et al. (1978), and Porter (1998).

Porter (1998) distinguishes three potentially successful generic strategies:

- Cost leadership: having the lowest costs in an industry;
- Differentiation: being uniquely valuable industry-wide in a non-monetary dimension (e.g., quality or innovation);
- Focus: focusing on a particular business area within an industry (e.g., buyer group, product line, geographic market).

Normally, studies on MCS and Porter's strategies (1998) only distinguish between differentiation and cost leadership strategies, which are mutually incompatible. In contrast, a focus strategy cannot be applied industry-wide but only to a particular segment and is therefore not considered in these studies (Dent, 1990). Covin and Slevin (1989) categorize company strategies "along a continuum ranging from conservative to entrepreneurial" (Covin, 1991, p. 439). Companies with a conservative strategy are characterized by a risk-averse, non-innovative, and reactive management style (Covin & Slevin, 1989). Companies with an entrepreneurial strategy are risk-taking, innovative, and proactive (Covin, 1991).

Miles et al. (1978) distinguish companies according to their innovation strategy into three types:

- Defenders: defenders focus on a narrow market segment, offer only a small product range, and try to prevent potential competitors from entering their niche. Due to this focus, they have a tendency to ignore developments outside their market segment.
- Prospectors: prospectors are innovative companies that are always trying to find and develop new product and market opportunities. Because of this, their market segment is usually broad and continuously developing.
- Analyzers: analyzers are a combination of prospectors and defenders, generating the bulk of their sales with stable products and only entering new markets via imitation of successful innovations.

Gupta and Govindarajan (1984) define three strategies by means of market share and profit orientation (Guilding, 1999):

- Build: companies strive for a market share increase by accepting low returns in the short-to-medium term if necessary.
- Hold: companies try to maintain their market share and obtain an acceptable return.
- Harvest: companies tend to maximize their short-term profit by accepting lower market shares if necessary.

In order to compare Chenhall's (2003) propositions concerning strategy with performance and savings measurement for CEP, two researchers independently classified the case companies according to Covin and Slevin (1989), Gupta and Govindarajan (1984), Miles et al. (1978), and Porter (1998) in the presented categories.

Proposition 18: Strategies characterized by conservatism, defender orientations and cost leadership are more associated with formal, traditional MCS focused on cost control, specific operating goals and budgets and rigid budget controls, than entrepreneurial, build and product differentiation strategies.

Formal and traditionally focused procurement performance measurement systems are characterized by the preference for financial performance measures, the extensive usage of special methods and instruments (e.g., purchasing balanced scorecard, IT and ratio systems), the usage of a savings guideline, and the application of the budget comparison method. To examine Chenhall's (2003) proposition, the relation between the characteristics of formal and traditionally focused procurement performance measurement systems and different strategy classifications was analyzed.

In the analysis, no relation between the strategy and the use of a savings guideline or the application of a budget comparison method to measure savings for CEP was found. Concerning the use of financial performance measures, companies with a cost leadership strategy have a slightly higher share of financial measures (25%) than companies with a differentiation strategy (22%). As far as the use of special procurement performance measurement methods and instruments is concerned, the opposite of Chenhall's (2003) proposition was found. While companies with a conservative strategy use an average of 1.3 methods and instruments, companies with an entrepreneurial strategy use an average of 2.4 methods and instruments. To summarize the findings, in most cases no correlation were found and the few identified correlations gave an ambiguous message about the proposition, which therefore mostly cannot be confirmed for CEP performance measurement.

In this context, furthermore the relation between the strategy and the professionalism degree of procurement performance measurement was analyzed, which involves the usage of dimensions and KPIs, and considered purchasing groups as well as the methods and instruments used. Here the results showed that cost leadership, entrepreneurial, and prospector companies are more professional than their counterparts, leading to the adapted proposition: *Strategies characterized by conservatism, defender orientations, and cost leadership are associated with a higher professionalism degree of procurement performance measurement.*

Proposition 19: Concerning product differentiation, competitor focused strategies are associated with broad scope MCS for planning purposes, and customization strategies are associated with aggregated, integrated and timely MCS for operational decisions.

In this proposition, Chenhall (2003) distinguishes between competitor-focused and customization strategies for product differentiation. The competitor-focused strategy uses competitor analysis to attain competitive advantage (Porter, 1998). Product differentiation is primarily guided by the products of the competitors. In the study by Bouwens and Abernethy (2000), which is the basis for Chenhall's (2003) proposition, the authors refer to tailored customization for product differentiation. In the concept of tailored customization, a potential buyer is able to adapt a basic product to his individual wishes (Lampel & Mintzberg, 1996). In the study, two researchers independently classified case companies according to their product differentiation strategy into competitor focus and customization.

In the interviews, it was asked which benefits companies achieve from performance measurement for CEP and how they use the results. Typical benefits and result usages for planning purposes are transparency, internal marketing, and budget planning. Companies using the results mainly for operational decisions mentioned – for example – use in the incentive system, as decision support, and as a tool to reduce costs. Companies with a competitor-focused strategy mainly use performance measurement for CEP for planning purposes (seven of eight), while companies with a customization strategy prefer to use this instrument for operational decisions (four of six). Four companies did not provide any information. Based on this analysis, the proposition is also true for performance measurement for CEP.

Proposition 20: Entrepreneurial strategies are associated with both formal, traditional MCS and organic decision making and communications.

First, the association of entrepreneurial strategies with both formal and traditional MCS was analyzed. Regarding this point, the proposition seems to contradict proposition 18, in which the conservatism strategy is associated with formal and traditional MCS. As already mentioned in the discussion on proposition 18, there is no correlation between the entrepreneurial strategy and the use of financial performance measures, the application of a savings guideline, and the use of the budget comparison method. Concerning the employment of special procurement performance measurement methods and instruments, proposition 20 is supported. Companies with entrepreneurial strategies use, on average, almost twice as many methods and instruments as companies with a conservative strategy. The possible motivation for

this is that risk-taking and proactive companies need more performance measurement methods and instruments.

The study further analyzed the relationship between entrepreneurial strategies and the application of organic performance measurement for CEP (competitor-focused, employment of task forces and meetings, budgetary slack). In the case study, only one out of eight companies with an entrepreneurial strategy employs organic performance measurement for CEP. However, companies with an entrepreneurial strategy use more often the flexible instrument of a purchasing balanced scorecard (seven of eight) than conservative companies (two of nine). Considering both analyses, the proposition is mostly not confirmed and can be adapted as follows: *Entrepreneurial strategies are associated with formal and flexible procurement performance measurement systems.*

Proposition 21: Strategies characterized by defender and harvest orientations and following cost leadership are associated with formal performance measurement systems including objective budget performance targets, compared to more prospector strategies which require informal, open MCS characterized by more subjective long term controls and interactive use of budgets focused on informal communications.

Similar to the previous propositions, formal procurement performance measurement systems are operationalized by a preference for financial performance measures, the extensive use of special methods and instruments (e.g., purchasing balanced scorecard, IT and ratio systems), the usage of a savings guideline, and the application of the budget comparison method. As already stated in proposition 18, no correlation with regard to defender strategies and only a slight preference for the use of financial performance measures in the cost leadership strategy were found. One interesting finding in this context is that companies with a cost leadership strategy use procurement performance measurement most (the involvement of dimensions, KPIs, and purchasing groups as well as the usage of methods and instruments). Because all the companies except for one apply the hold strategy, it is not possible to analyze the harvest orientation in the study.

For prospector strategies, Chenhall (2003) expects informal and open MCS to be characterized by subjective long-term controls. In CEP purchasing performance

measurement, the satisfaction of internal customers is a major subjective long-term measure. However, the findings disagree with Chenhall's (2003) proposition. While defender (four of six) and analyzer (five of nine) strategies attempt to evaluate internal customers' satisfaction, none of the prospector companies determines this measure.

As a summary, the proposition can only be confirmed with regard to the cost leadership strategy and needs to be adapted as follows for the context of the research: *The cost leadership strategy is associated with formal procurement performance measurement systems.*

B.4.7. Proposition concerning culture and management control systems

In the last section, a proposition about the design of MCS and national culture will be analyzed. The assumption underlying this proposition is: different countries possess particular cultural characteristics, such as varying knowledge, beliefs, art, morals, law, and habits (Chenhall, 2003).

Proposition 22: National culture is associated with the design of MCS.

In the analysis of purchasing performance measurement for CEP and national culture, the headquarter country and degree of internationalism in production to characterize the national culture were considered. Of the companies under consideration, eight had headquarters in Germany and ten had headquarters in Switzerland (incl. Liechtenstein). The degree of internationalism was defined by the number of countries with plants: low (fewer than five countries), medium (five to nine countries), and high (ten and more countries).

Both of these characteristics were related to company size (e.g., sales) in the case study. The average sales of the case companies are € 37.4 bn. for companies with headquarters in Germany and € 6.4 bn. in Switzerland and € 2.2 bn. for companies with a low, € 14.4 bn. for companies with a medium, and € 39.7 bn. for companies with a high degree of internationalism. Because of this, the focus lied on characteristics in procurement performance measurement that are independent from the company size.

Looking at the headquarters site, connections to the result usage for performance measurement for CEP and the share of financial measures were found. In Germany, all

the companies use performance measurement results for planning purposes (e.g., transparency, internal marketing, and budget planning), but the majority in Switzerland (five of seven) use these results for operational decisions (e.g., incentive system, decision support, and to reduce costs). Four companies failed to provide any information. It would appear that German companies are more focused on planning, while Swiss companies give priority to operational tasks in MCS.

The share of financial measures in performance measurement is larger in German companies (27%) than in Swiss companies (19%). Companies with headquarters in Switzerland thus seem to have a broader view of CEP performance measurement.

Next, the relationship between the degree of production internationalization and the CEP performance measurement were analyzed. The results showed that the use of savings measurement results for internal marketing purposes is influenced by the degree of internationalization. The higher the internationalization degree, the more companies use the results for marketing purposes, possibly because procurement departments in international companies are under more pressure to justify their performance.

Furthermore, interviewees in highly international companies are much more concerned about manipulation in savings measurement for CEP in their industries. Because of their international orientation, these companies seem to have a more realistic view of savings measurement for CEP.

Based on these findings, Chenhall's (2003) proposition on national culture and MCS also holds true for CEP performance measurement.

In this context, company culture was examined in greater depth and the case companies were classified according to Deal and Kennedy (1982) into the following types:

- Work-hard, play-hard culture: rapid feedback / reward and low risk (e.g., restaurants, software companies);
- Tough-guy macho culture: rapid feedback / reward and high risk (e.g., police, surgeons, sports);
- Process culture: slow feedback / reward and low risk (e.g., banks, insurance companies);

- Bet-the-company culture: slow feedback / reward and high risk (e.g., aircraft manufacturers, oil companies).

In the analysis, it was obvious that companies with a process culture use CEP performance and savings measurement more often, have more formalized systems, and use performance results more frequently. This behavior fits well with the definition of the process culture and also supports the idea that culture has an influence on MCS.

B.5. Conclusion and outlook

Performance measurement and savings measurement for CEP face some special challenges and thus differ significantly from other MCS. The challenges concerning performance measurement for CEP – in general – are, for example, success allocation, budget changes, high variability of prices and delivery times, uncertain payment flows, high risks, and the difficulty of considering long-term business relations and trust. Challenges in CEP savings measurement could consist of: the definition of correct reference prices, manipulation and consideration of TCO, benefits, and qualitative aspects of capital equipment. The goal of the study was to examine how these challenges and circumstances influence contingency-based relationships in performance and savings measurement for CEP.

The research method applied to analyze the topic was case studies with “performance and savings measurement for CEP within a company” as the unit of analysis. During the data collection, semi-structured interviews, as the main method, were combined with the analysis of financial statements and internal company documents (e.g., organization charts, guidelines to calculate savings, and sample calculations). In total, 24 interviews were conducted with 32 respondents from 18 different companies in Germany, Switzerland, and the U.S. With the involvement of the chief executive officer, head of procurement, head of production, purchaser, and employees from procurement management, many different company functions were considered. To analyze the information gathered, data reduction, data display, and conclusion drawing / verification were applied.

Chenhall (2003) provides a meta-analysis of findings from contingency MCS studies, in which he formulates propositions concerning MCS and contingent factors of

external environment, technology, organizational structure, size, strategy, and national culture. Because performance and savings measurement for CEP as a form of MCS faces special challenges and circumstances, the case study findings are compared with the propositions formulated by Chenhall (2003).

The results of the analysis will now be summarized and discussed. Of the 22 analyzed propositions, a majority were confirmed: 10 confirmed, 1 mostly confirmed, 3 partially confirmed, 3 mostly unconfirmed, and 5 unconfirmed propositions (Table B-6). The results concerning performance and savings measurement for CEP show that many relationships between this form of MCS and the contingent factors exist. However, the results seem to confirm that performance and savings measurement for CEP is a special case of MCS because 8 propositions are not or mostly not confirmed. Furthermore, differences between the contingent areas of the propositions were found. While, with regard to size and MCS (3 of 3) as well as to culture and MCS (1 of 1), all the propositions are confirmed, the following contingent areas are only partially confirmed (sorted in descending order):

- Generic concepts of technology and MCS: 2 confirmed, 1 partially confirmed;
- Advanced technologies and MCS: 1 confirmed, 1 unconfirmed;
- External environment: 1 mostly confirmed, 1 partially confirmed, 1 unconfirmed;
- Organizational structure and MCS: 2 confirmed, 1 partially confirmed, 3 unconfirmed;
- Strategy and MCS: 1 confirmed, 3 mostly unconfirmed.

These confirmation differences point to the propositions' validity in the analyzed contingent areas. While size and culture have a very strong influence, organizational structure and strategy have a much lower influence on MCS. For unconfirmed and mostly unconfirmed propositions, adapted propositions for the case of purchasing and savings measurement for CEP were presented, providing another scientific implication of the research.

The results of the study also provide several managerial implications for the design of MSC, which will be discussed in the following.

Companies in an uncertain environment must remain flexible in order to be able to react quickly to economic fluctuations. An important measure of flexibility is the enhancement of the material ratio for goods and services. If this is the case, the MCS should be adapted to this development and strengthen the importance of procurement performance measurement. Because procurement performance largely depends on supplier performance, suppliers and supplier relationships should be involved more in performance measurement, not just internal procurement.

Companies in an uncertain environment are more likely to use participative budgeting, probably because employees in uncertain situations try to spread the risk and involve more departments in the budgeting process. A possible danger in this behavior is that – according to the risky shift phenomenon – groups tend to make riskier decisions than individuals (Isenberg, 1986; Myers & Lamm, 1975). Applied to budgeting, one could expect that groups determine riskier (lower) budgets that are more difficult to meet, especially in uncertain situations.

If processes are characterized by a low degree of standardization and automation, companies should have a broader view of financial and non-financial measures. In these cases, focusing only on financial measures does not satisfy the different requirements of procurement performance measurement. Furthermore, processes with a low degree of standardization and automation are often related to missing historical values for budgets and reference measures. In these cases, companies should be alert to the possibility of manipulation in performance measurement and budgetary slack. MCS should be robust to possible manipulation attempts.

If historical values to evaluate entire processes or products are not available, it is often possible to split them into components for which historical values exist. One way to reduce the budgetary slack for CEP projects is the combination of top-down and bottom-up budgeting (Albrecht et al., 2010).

Employees in smaller companies prefer performance-linked payment because they have the feeling that they can actually influence performance measures through their personal performance. It can be concluded that smaller companies should establish this payment method. A major challenge in the context of MCS is to establish simple and objective measures that correlate with the company and procurement goals.

In supplier partnership practices, non-financial measures and personal interactions should be used to manage these partnerships successfully for both parties. Supplier partnerships cannot be managed solely by financial measures and automated data exchange. Financial measures often measure only the symptoms of possible negative developments. The usage of non-financial measures and personal interactions in MCS, in contrast, helps to highlight the reasons for problems in supplier buyer relationships and can provide possible solution approaches.

The use of methods, instruments, and guidelines in performance measurement for CEP should fit the size and the strategy of the company. According to contingency theory, each company should determine the most effective organizational design for the individual context. In performance and savings measurement for CEP, size and strategy are particularly important contextual variables. Examples include the following: small companies should use basic and less sophisticated controls; companies with a cost leadership strategy should focus on MCS with financial measures and prospector strategies on innovation measures and risk-taking; and proactive companies with an entrepreneurial strategy need multiple performance measurement methods and instruments.

CEP is associated with special characteristics and challenges that should be considered in MCS. For example, many different company functions are involved in CEP. Therefore, the different parties should also be involved in the budgeting process through the application of participative budgeting. CEP also often faces high task and environmental uncertainty, making it necessary to use a broad scope of performance measures (e.g., savings, delivery time, quality, safety).

Finally, national and company culture should be considered when designing MCS for CEP. Examples of differences based on national culture are the use of performance results for planning purposes (e.g., transparency, internal marketing, and budget planning) or operational decisions (e.g., incentive system, decision support, and to reduce costs) and the degree of financial measure use. Furthermore, the general and result use of performance and savings measurement for CEP, as well as the degree of formalization, should follow the company culture.

Of course, the analysis has limitations. First, as in any case study research, the analysis is located in the specific context of the 18 companies and 32 interviewees studied. For

example, only companies with headquarters in Germany, Switzerland, and Lichtenstein were analyzed. In other regions different results might be revealed. Second, although 18 cases is a large number in case study research, the results are, of course, not statistically significant. Third, in order to be able to analyze more than 350 transcript pages, data reduction was applied, meaning that detailed information disappeared. Fourth, each company was classified with different criteria, such as strategy and culture. Although several researchers conducted the classification, it was still influenced by some subjective perceptions. Fifth, in the study Chenhall's (2003) propositions were transferred to and tested in the context of performance and savings measurement for CEP. The author tried to select the most suitable measures to test the propositions but other researchers could regard other measures as more suitable and attain different results. Sixth, it was only analyzed whether a relationship exists between performance and savings measurement for CEP and different contingent variables. The study did not analyze the reasons for these coherences but only discussed the possible reasons.

The limitations of this analysis also provide a basis for further research. Further studies should explore whether similar findings can also be observed in other countries and cultures. In order to obtain statistically significant results, a survey with a large sample size could be conducted. Further research should also focus on the reasons for the relationships discovered. Furthermore, performance and savings measurement for other special purchasing groups (e.g. services) could be analyzed.

References

Abernethy, M. A. & Lillis, A. M. (1995). The Impact Of Manufacturing Flexibility On Management Control System Design. Accounting, Organizations and Society, 20(4), 241-258.

Albrecht, W. S., Stice, E. K., Stice, J. D. & Monte R. Swain, P. D. (2010). Accounting: Concepts and Applications. Maison, OH: Cengage Learning.

Alvesson, M. & Kärreman, D. (2004). Interfaces of Control. Technocratic and Socio-ideological Control in a Global Management Consultancy Firm. Accounting, Organizations and Society, 29(3-4), 423-444.

Anthony, R. N. (1965). Planning and Control Systems: A Framework for Analysis. Cambridge, MA: Division of Research, Graduate School of Business Administration, Harvard University.

Ashenbaum, B. (2006). Defining Cost Reduction and Cost Avoidance. Tempe, AZ: Center for Advanced Purchasing Studies.

Atkinson, A. A. & Shaffir, W. (1998). Standards for Field Research in Management Accounting. Journal of Management Accounting Research, 10, 41-68.

Axelsson, B., Laage-Hellman, J. & Nilsson, U. (2002). Modern Management Accounting for Modern Purchasing. European Journal of Purchasing & Supply Management, 8(1), 53-62.

Berry, A. J., Broadbent, J. & Otley, D. (2005). Management Control: Theories, Issues and Performance (2nd ed.). Basingstoke: Palgrave Macmillan.

Bonner, S. E. & Sprinkle, G. B. (2002). The Effects of Monetary Incentives on Effort and Task Performance: Theories, Evidence, and a Framework for Research. Accounting, Organizations and Society, 27(4-5), 303-345.

Bouwens, J. & Abernethy, M. A. (2000). The Consequences of Customization on Management Accounting System Design. Accounting, Organizations and Society, 25(3), 221-241.

Burt, D. N., Dobler, D. W. & Starling, S. L. (2003). World Class Supply Management: The Key to Supply Chain Management (7th ed.). New York, NY: McGraw-Hill College.

CAPS Research (2005). Benchmarking Report Narrative Summary. Focus on ... Capital Spend 2004. Tempe, AZ: Center for Advanced Purchasing Studies.

CAPS Research (2011). Reporting Cost Savings. Tempe, AZ: Center for Advanced Purchasing Studies.

Chenhall, R. H. (2003). Management Control Systems Design within its Organizational Context: Findings from Contingency-Based Research and Directions for the Future. Accounting, Organizations and Society, 28(2-3), 127-168.

Chenhall, R. H. & Morris, D. (1986). The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems. The Accounting Review, 61(1), 16-35.

Child, J. (1972). Organizational Structure, Environment and Performance: The Role of Strategic Choice. Sociology, 6(1), 1-22.

Corbin, J. M. & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons, and Evaluative Criteria. Qualitative Sociology, 13(1), 3-21.

Covaleski, M. A., Dirsmith, M. W. & Samuel, S. (1996). Managerial Accounting Research: The Contributions of Organizational and Sociological Theories. Journal of Management Accounting Research, 8, 1-35.

Covin, J. G. (1991). Entrepreneurial Versus Conservative Firms: A Comparison of Strategies and Performance. Journal of Management Studies, 28(5), 439-462.

Covin, J. G. & Slevin, D. P. (1989). Strategic Management of Small Firms in Hostile and Benign Environments. Strategic Management Journal, 10(1), 75-87.

Davila, A. (2008). Performance Measurement and Management Control Systems: Current Research and Ideas Going Forward. In: M. J. Epstein & J.-F. Manzoni (Eds.), Performance Measurement and Management Control: Measuring and Rewarding Performance (Vol. 18, 43-69). Bingley: Emerald Group Publishing Limited.

Deal, T. E. & Kennedy, A. A. (1982). Corporate Cultures: The Rites and Rituals of Corporate Life. New York, NY: Addison-Wesley.

Dent, J. F. (1990). Strategy, Organization and Control: Some Possibilities for Accounting Research. Accounting, Organizations and Society, 15(1-2), 3-25.

Discenza, R. & Gurney, B. (1990). New Considerations for Evaluating Capital Equipment Purchases. Production & Inventory Management Journal, 31(2), 33-37.

Dmytrenko, A. L. (1997). Cost Benefit Analysis. Records Management Quarterly, 31(1), 16-20.

Dobler, D. W., Burt, D. N. & Lee, L. (1990). Purchasing and Materials Management: Text and Cases (5th ed.). New York, NY: McGraw-Hill College.

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.

Dul, J. & Hak, T. (2007). Case Study Methodology in Business Research. Burlington, MA: Oxford Butterworth-Heinemann.

Dumond, E. J. (1994). Moving Toward Value-Based Purchasing. International Journal of Purchasing & Materials Management, 30(2), 2-8.

Dunk, A. S. (1993). The Effect of Budget Emphasis and Information Asymmetry on the Relation between Budgetary Participation and Slack. The Accounting Review, 68(2), 400-410.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. Academy of Management Review, 14(4), 532-550.

Ellram, L. M. (1995). Total Cost of Ownership: An Analysis Approach for Purchasing. International Journal of Physical Distribution & Logistics Management, 25(8), 4-23.

Ellram, L. M. & Siferd, S. P. (1998). Total Cost of Ownership: A Key Concept in Strategic Cost Management Decisions. Journal of Business Logistics, 19(1), 55-84.

Emiliani, M. L., Stec, D. J. & Grasso, L. P. (2005). Unintended Responses to a Traditional Purchasing Performance Metric. Supply Chain Management, 10(3), 150-156.

Eurostat. (2012). Short-Term Business Statistics. Retrieved 03.03.2012, from http://epp.eurostat.ec.europa.eu/portal/page/portal/short_term_business_statistics/introduction

Fearon, H. E. & Bales, A. W. (1995). Purchasing of Nontraditional Goods and Services. Tempe, AZ: Center for Advanced Purchasing Studies.

Fisher, J. (1995). Contingency-based Research on Management Control Systems: Categorization by Level of Complexity. Journal of Accounting Literature, 14, 24-53.

Fisher, J. & Govindarajan, V. (1993). Incentive compensation design, strategic business unit mission, and competitive strategy. Journal of Management Accounting Research, 5, 129-129.

Flamholtz, E. G. (1983). Accounting, Budgeting and Control Systems in Their Organizational Context: Theoretical and Empirical Perspectives. Accounting, Organizations and Society, 8(2-3), 153-169.

Flyvbjerg, B. (2006). Five Misunderstandings about Case-Study Research. Qualitative Inquiry, 12(2), 219-245.

Fontana, A. & Frey, J. H. (2000). The Interview: From Structured Questions to Negotiated Text. In: N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of Qualitative Research (2nd ed., 645-672). Thousand Oaks, CA: Sage.

Gibbert, M., Ruigrok, W. & Wicki, B. (2008). What Passes as a Rigorous Case Study? Strategic Management Journal, 29(13), 1465-1474.

Gordon, L. A. & Miller, D. (1976). A Contingency Framework for the Design of Accounting Information Systems. Accounting, Organizations and Society, 1(1), 59-69.

Govindarajan, V. (1984). Appropriateness of Accounting Data in Performance Evaluation: An Empirical Examination of Environmental Uncertainty as an Intervening Variable. Accounting, Organizations and Society, 9(2), 125-125.

Govindarajan, V. & Fisher, J. (1990). Strategy, Control Systems, and Resource Sharing: Effects on Business-Unit Performance. Academy of Management Journal, 33(2), 259-285.

Govindarajan, V. & Gupta, A. K. (1985). Linking Control Systems to Business Unit Strategy: Impact on Performance. Accounting, Organizations and Society, 10(1), 51-66.

Green, S. G. & Welsh, M. A. (1988). Cybernetics and Dependence: Reframing the Control Concept. Academy of Management Review, 13(2), 287-301.

Guilding, C. (1999). Competitor-focused Accounting: An Exploratory Note. Accounting, Organizations and Society, 24(7), 583-595.

Gupta, A. K. & Govindarajan, V. (1984). Business Unit Strategy, Managerial Characteristics, and Business Unit Effectiveness at Strategy Implementation. Academy of Management Journal, 27(1), 25-41.

Hofmann, E., Maucher, D., Hornstein, J. & den Ouden, R. (2012). Capital Equipment Purchasing: Optimizing the Total Cost of CapEx Sourcing. Berlin, Heidelberg, New York: Springer.

Holschbach, E. & Hofmann, E. (2011). Exploring Quality Management for Business Services from a Buyer's Perspective Using Multiple Case Study Evidence. International Journal of Operations & Production Management, 31(6), 648-685.

Isenberg, D. J. (1986). Group Polarization: A Critical Review and Meta-analysis. Journal of Personality and Social Psychology, 50(6), 1141-1151.

Kim, S.-H., Cohen, M. A. & Netessine, S. (2007). Performance Contracting in After-Sales Service Supply Chains. Management Science, 53(12), 1843-1858.

Lampel, J. & Mintzberg, H. (1996). Customizing Customization. Sloan Management Review, 38(1), 21-21.

Leenders, M. R., Johnson, P. F., Flynn, A. E. & Fearon, H. E. (2009). Purchasing Supply Management (13th ed.). New York, NY: McGraw-Hill Education.

Lowe, E. A. (1971). On the Idea of a Management Control System. Journal of Management Studies, 8(1), 1-12.

Macintosh, N. B. & Daft, R. L. (1987). Management Control Systems and Departmental Interdependencies: An Empirical Study. Accounting, Organizations and Society, 12(1), 49-61.

Macintosh, N. B. & Quattrone, P. (2010). Management Accounting and Control Systems: An Organizational and Sociological Approach. Chichester: John Wiley & Sons.

Malmi, T. & Brown, D. A. (2008). Management Control Systems as a Package-Opportunities, Challenges and Research Directions. Management Accounting Research, 19(4), 287-300.

Maucher, D. & Hofmann, E. (2013). Savings Measurement for Capital Equipment Purchasing: Challenges and Conceptual Model (forthcoming). International Journal of Productivity and Performance Management.

McCutcheon, D. M. & Meredith, J. R. (1993). Conducting Case Study Research in Operations Management. Journal of Operations Management, 11(3), 239-256.

Merchant, K. A. (1985a). Budgeting and the Propensity to Create Budgetary Slack. Accounting, Organizations and Society, 10(2), 201-210.

Merchant, K. A. (1985b). Control in Business Organizations. Boston, MA: Pitman.

Merchant, K. A. (1985c). Organizational Controls and Discretionary Program Decision Making: A Field Study. Accounting, Organizations and Society, 10(1), 67-85.

Merchant, K. A. (1990). The Effects of Financial Controls on Data Manipulation and Management Myopia. Accounting, Organizations and Society, 15(4), 297-313.

Merchant, K. A. & Van der Stede, W. A. (2007). Management Control Systems: Performance Measurement, Evaluation and Incentives. Essex: Financial Times/Prentice Hall.

Mia, L. & Goyal, M. (1991). Span of Control, Task Interdependence and Usefulness of MAS Information in Not-For-Profit Government Organizations. Financial Accountability & Management, 7(4), 249-266.

Miles, M. B. & Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. London: Sage Publications.

Miles, R. E., Snow, C. C., Meyer, A. D. & Coleman, H. J., Jr. (1978). Organizational Strategy, Structure, and Process. Academy of Management Review, 3(3), 546-562.

Monczka, R. M., Trent, R. J. & Handfield, R. B. (2002). Purchasing and Supply Chain Management (2nd ed.). Cincinatti, OH: South-Western College Pub.

Morssinkhof, S., Wouters, M. & Warlop, L. (2011). Effects of Providing Total Cost of Ownership Information on Attribute Weights in Purchasing Decisions. Journal of Purchasing & Supply Management, 17(2), 132-142.

Myers, D. G. & Lamm, H. (1975). The Polarizing Effect of Group Discussion. American Scientist, 63(3), 297-303.

Neely, A., Gregory, M. & Platts, K. (2005). Performance Measurement System Design: A Literature Review and Research Agenda. International Journal of Operations & Production Management, 25(12), 1228-1263.

Nollet, J., Calvi, R., Audet, E. & Côté, M. (2008). When Excessive Cost Savings Measurement Drowns the Objectives. Journal of Purchasing & Supply Management, 14(2), 125-135.

Otley, D. T. (1980). The Contingency Theory of Management Accounting: Achievement and Prognosis. Accounting, Organizations and Society, 5(4), 413-428.

Otley, D. T. (1999). Performance Management: A Framework for Management Control Systems Research. Management Accounting Research, 10(4), 363-382.

Ouchi, W. G. (1979). A Conceptual Framework for the Design of Organizational Control Mechanisms. Management Science, 25(9), 833-848.

Perrow, C. (1974). Organizational Analysis: A Sociological View. Belmont, CA: Wadsworth Publishing Company.

Perry, J. H. (1987). A Conceptual Framework for Evaluating Capital Equipment Purchases. Journal of Purchasing & Materials Management, 23(4), 32-38.

Porter, M. E. (1998). Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York, NY: Free Press.

Quitt, A. (2010). Measuring Supply Management's Budget Effects: Introduction of Return on Spend as an Indicator of Supply Management's Financial Effectiveness. Diss., European Business School, Oestrich-Winkel.

Rockness, H. O. & Shields, M. D. (1984). Organizational Control Systems in Research and Development. Accounting, Organizations and Society, 9(2), 165-177.

Rubin, H. J. & Rubin, I. (1995). Qualitative Interviewing: The Art of Hearing Data. London: Sage Publications.

Salamon, G. L. & Dhaliwal, D. S. (1980). Company Size and Financial Disclosure Requirements with Evidence from the Segmental Reporting Issue. Journal of Business Finance & Accounting, 7(4), 555-568.

Selviaridis, K. (2011). Performance-Based Contracting: State of the Art and Future Directions. Paper presented at the 20th IPSERA Conference 2011, Maastricht.

Shields, J. F. & Shields, M. D. (1998). Antecedents of Participative Budgeting. Accounting, Organizations and Society, 23(1), 49-76.

Simons, R. (1990). The Role of Management Control Systems in Creating Competitive Advantage: New Perspectives. Accounting, Organizations and Society, 15(1-2), 127-143.

Smeltzer, L. R. & Manship, J. A. (2003). How Good Are Your Cost Reduction Measures? Supply Chain Management Review, 7(3), 28-33.

Talluri, S. (2002). Single Price System Model for Optimal Decisions in Capital Equipment Purchasing. International Journal of Production Research, 40(4), 1003-1016.

Thompson, J. D. (1967). Organizations in Action: Social Science Bases of Administrative Theory. New Brunswick, NJ: Transaction Publishers.

Voss, C., Tsikriktsis, N. & Frohlich, M. (2002). Case Research in Operations Management. International Journal of Operations & Production Management, 22(2), 195-219.

Woodward, J. (1958). Management and Technology. London: H. M. Stationery Off.

Wouters, M., Anderson, J. C. & Wynstra, F. (2005). The Adoption of Total Cost of Ownership for Sourcing Decisions: A Structural Equations Analysis. Accounting, Organizations and Society, 30(2), 167-191.

Yin, R. K. (2009). Case Study Research Design and Methods (4th ed.). Thousand Oaks, CA: Sage.

Appendix

Table B-3: Analyzed companies and their key characteristics

Company label	MF1	MF2	MF3	MF4	MF5	MF6	MF7	MF8
Industry	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing
Number of employees	10,000-99,999	≤999	≤999	10,000-99,999	1,000-9,999	10,000-99,999	≥100,000	≥100,000
Sales in m euro	1,000-9,999	≤99	100-999	1,000-9,999	1,000-9,999	1,000-9,999	≥10,000	≥10,000
Number of employees in procurement	100-999	≤9	10-99	100-999	10-99	Not provided	Not provided	≥1,000
Procurement volume in m euro	≥10,000	≤99	≤99	100-999	100-999	1,000-9,999	≥10,000	≥10,000
Material ratio	66%	58%	57%	25%	47%	60%	69%	66%
Share of capital equipment in procurement volume	9%	5%	3%	8%	1%	4%	4%	4%
Typical kinds of capital equipment	Conveying equipment (trucks, excavators), crushing plant	Indoor crane	Machine tools	Buildings, forklifts	Welding robot	Machines, facilities	Machines, manufacturing facilities	Cars, containers, reactors

Company label	**SE1**	**SE2**	**SE3**	**SE4**	**SE5**	**SE6**	**CT1**	**CT2**	**CP1**	**CP2**
Industry	Services	Services	Services	Services	Services	Services	Construction	Construction	Consumption	Consumption
Number of employees	10,000-99,999	≤999	10,000-99,999	1,000-9,999	≤999	≥100,000	1,000-9,999	≤999	≥100,000	10,000-99,999
Sales in m euro	1,000-9,999	≤99	1,000-9,999	1,000-9,999	≤99	≥10,000	100-999	≤99	≥10,000	≥10,000
Number of employees in procurement	100-999	10-99	100-999	100-999	≤9	Not provided	10-99	10-99	≥1,000	≥1,000
Procurement volume in m euro	1,000-9,999	1,000-9,999	1,000-9,999	≥10,000	≤99	100-999	100-999	1,000-9,999	≥10,000	≥10,000
Material ratio	42%	100%	54%	100%	31%	1%	45%	100%	51%	53%
Share of capital equipment in procurement volume	17%	28%	12%	66%	50%	80%	11%	100%	7%	7%
Typical kinds of capital equipment	Transmitting mast, software, network infrastructure	Control units, machines	Indoor cranes, machines	Computer, power supply lines	Eye laser device, eye examination device	Shop fittings, forklift, real estate	Asphalt mixing plant, excavator, truck, construction machineries	Parts of power plants, power supply lines	Machines, manufacturing facilities, new factories	Machines, manufacturing facilities

Table B-4: Summary of the interviewees' function in the companies

Label	MF1	MF2	MF3	MF4	MF5	MF6	MF7	MF8	SE1	SE2	SE3	SE4	SE5	SE6	CT1	CT2	CP1	CP2	Total
Chief executive officer (CEO)							1			1			1		1				4
Head of procurement	1		1		1				1					2		1			7
Head of production (responsible for CEP)		1				1													2
Purchaser	3			1										5					9
Procurement management (incl. controlling)	2					1		1	2		1	1					1	1	10
Total	6	1	1	1	1	2	1	1	3	1	1	1	1	7	1	1	1	1	32

Table B-5: Case study interview guideline

Topic	Sample questions
Procurement organization	• How is the procurement organization structured (central, local, lead buyer etc.)? • What do you understand by CEP and project procurement? • Is there an organizational separation of CEP and procurement of other goods and services? • How is CEP organizationally structured in your company? • How is the CEP process organized? • To what extent is the procurement organization involved in single process steps in CEP? • Who has the responsibility (depending on the investment volume) for CEP? • Do you analyze the "Total Cost of Ownership" or the "Life Cycle Cost" for CEP? If yes, for which kinds of capital equipment? • How is the budgeting process for CEP conducted? Who defines the budget? • How many employees work in the procurement organization at your company? How many employees work in the field of CEP? • What is the proportion of employees with an academic background (in general and for CEP)? • Do employees working in the field of CEP have a special education or advanced training for this job? • What is the maverick buying ratio in your company (in general and for CEP)? • Is there an incentive system for the procurement employees? • Is there a written procurement strategy with targets and responsibilities? If so, is CEP mentioned in it?
Procurement performance measurement	• How important is procurement performance measurement for you? Why is it important? • Do you think that procurement performance measurement will gain importance in the future? • What challenges do you see in procurement performance measurement? • Do you apply procurement performance measurement? • Which dimensions do you consider in procurement performance measurement? • For which commodity groups do you apply performance measurement? • What methods and instruments do you use for procurement performance measurement?
General savings measurement	• Do you apply savings measurement? • What are the benefits of savings measurement? • Does saving measurement present you with particular challenges? • Do you distinguish between different kinds of savings? • For which commodity groups do you apply savings measurement? • Is there an IT system or tool for savings measurement? • Who determines the methods and systems used for savings measurement? • Are only realized savings calculated or are estimated and planned savings also calculated? • Are the savings measurements results used for accounting purposes (e.g., budgeting)? • Are the savings measurements results used for incentive systems for purchasers? • Are the savings measurements results used for other purposes?

Savings measurement for CEP	• How important is savings measurement for CEP for you? Why is it important? • How does the process for saving measurement for capital equipment work? • What are the challenges in saving measurement for capital equipment? • What is the amount of the purchased capital equipment for which saving measurement is conducted? • On which criteria do you decide to conduct savings measurement for a specific CEP project? • Which methods do you use to calculate savings for CEP? If different methods are applied: how do you select the specific method? • How long does it take, on average to calculate savings for CEP? • Are the calculated savings distributed over several years? • Do you consider the Total Cost of Ownership for saving measurement? • Are there any saving targets for CEP? • How do you deal with saving measurement for CEP if several employees are involved in the process? • Do you conduct saving measurement for leasing or performance contracting? • Do you believe that, in other companies from your industry, purchasers try to manipulate the results of saving measurement for CEP? • Do you see possibilities in manipulating your calculation methods? • Have there been cases in which savings measurement for CEP could not be conducted? • Are you satisfied with the calculation methods you are using? • What requirements do you have for a best practice calculation method for saving measurement for CEP? • How successful do you rate CEP in your company compared to your competitors? • How do you rate the influence of saving measurement on the CEP performance?
Examples of savings measurement for CEP	• Can you explain the procedures and calculations for saving measurement for CEP with reference to a specific example? • Is there anything to be learned from this example of saving measurement? • Were there attempts to manipulate the savings results in this project? • Did the project remain within the set budget? • How satisfied have you been in general with this project?
Statistical information	• Sex of the interviewee • Age of the interviewee • What is your position within the company? • What kind of educational qualifications do you have? • How long have you worked in your current position? • How many years of professional experience do you have? • How long have you been concerned with savings measurement for CEP? • To which industry does the company belong? • How many employees work in your company in total? • At which sites is the company represented? • In how many countries does the company have production sites? • How large are the sales of your company? • How much is the procurement volume of your company? • What share (percentage and absolute) of the procurement volume in your company is taken up by capital equipment?

Table B-6: Summary of the comparison of the research findings with Chenhall's (2003) propositions

Proposition			**Validity concerning performance measurement for CEP**
Concerning	**No.**	**Statement**	
External environment	1	The more uncertain the external environment the more open and externally focused the MCS.	Partially confirmed
	2	The more hostile and turbulent the external environment the greater the reliance on formal controls and an emphasis on traditional budgets.	Not confirmed
	3	Where MCS focused on tight financial controls are used in uncertain external environments they will be used together with an emphasis on flexible, interpersonal interactions.	Mostly confirmed
Generic concepts of technology and MCS	4	The more technologies are characterized by standardized and automated processes the more formal the controls including a reliance on process control, and traditional budgets with less budgetary slack.	Partially confirmed
	5	The more technologies are characterized by high levels of task uncertainty the more informal the controls including: less reliance on standard operating procedures, programmes and plans, accounting performance measures, behaviour controls; higher participation in budgeting; more personal controls, clan controls, and usefulness of broad scope MCS.	Confirmed
	6	The more technologies are characterized by high levels of interdependence the more informal the controls including: fewer statistical operating procedures; more statistical planning reports and informal coordination; less emphasis on budgets and more frequent interactions between subordinates and superiors; greater usefulness of aggregated and integrated MCS.	Confirmed
Advanced technologies and MCS	7	The extent to which combinations of advanced technologies and non-financial performance measures are associated with enhanced performance depends on the degree to which the measures are used as part of reward and compensation schemes.	Not confirmed
	8	Supplier partnership practices are associated with non-financial measures, informal meetings and interactions across the value chain.	Confirmed

Proposition			**Validity concerning performance measurement for CEP**
Concerning	**No.**	**Statement**	
Organizational structure and MCS	9	Large organizations with sophisticated technologies and high diversity that have more decentralized structures are associated with more formal, traditional MCS (e.g., budgets, formal communications).	Confirmed
	10	Research and development departments compared to marketing departments, which face higher levels of task uncertainty, are associated with participative budgeting; and marketing compared to production departments, which face higher levels of external environmental uncertainty, are associated with more open, informal MCS.	Confirmed
	11	The structural characteristics of functional differentiation based on research and development compared to marketing, leadership style characterized by a consideration compared to initiating style, and higher levels of decentralization are associated with participative budgeting.	Not confirmed
	12	Decentralization is associated with the MCS characteristics of aggregation and integration.	Not confirmed
	13	Team based structures are associated with participation and comprehensive performance measures used for compensation.	Partially confirmed
	14	Organic organizational structures are associated with perceptions that future orientated MCS are more useful, and with the effective implementation of activity analysis and activity-cost analysis.	Not confirmed
Size and MCS	15	Large organizations are associated with more diversified operations, formalization of procedures and specialization of functions.	Confirmed
	16	Large organizations are associated with more divisionalized organizational structures.	Confirmed
	17	Large size is associated with an emphasis on and participation in budgets and sophisticated controls.	Confirmed

Proposition			**Validity concerning performance measurement for CEP**
Concerning	**No.**	**Statement**	
Strategy and MCS	18	Strategies characterized by conservatism, defender orientations and cost leadership are more associated with formal, traditional MCS focused on cost control, specific operating goals and budgets and rigid budget controls, than entrepreneurial, build and product differentiation strategies.	Mostly not confirmed
	19	Concerning product differentiation, competitor focused strategies are associated with broad scope MCS for planning purposes, and customization strategies are associated with aggregated, integrated and timely MCS for operational decisions.	Confirmed
	20	Entrepreneurial strategies are associated with both formal, traditional MCS and organic decision making and communications.	Mostly not confirmed
	21	Strategies characterized by defender and harvest orientations and following cost leadership are associated with formal performance measurement systems including objective budget performance targets, compared to more prospector strategies which require informal, open MCS characterized by more subjective long term controls and interactive use of budgets focused on informal communications.	Mostly not confirmed
Culture and MCS	22	National culture is associated with the design of MCS.	Confirmed

C. Effects of intra-organizational control systems on inter- and intra-organizational negotiations: The case of capital equipment purchasing

C.1. Introduction

The relationship between accounting and inter-organizational relationships has received sustained academic attention over the past 20 years. The literature has documented that accounting in and of inter-organizational relationships is important and has conceptualized how it works, how it should work, and how it relates to the development of relationships (e.g., Caglio & Ditillo, 2008; Cooper & Slagmulder, 2004; Frances & Garnsey, 1996; Håkansson & Lind, 2004; Langfield-Smith & Smith, 2003; Mouritsen et al., 2001; Mouritsen & Thrane, 2006; Tomkins, 2001; van der Meer-Kooistra & Vosselman, 2000).

The bulk of this literature has studied how the inter-organizational relationship is controlled via a number of patterns and control mechanisms. Van der Meer-Kooistra and Vosselman (2000) analyzed the factors that lead to the use of different control patterns (market, bureaucratic, and trust-based). Tomkins (2001) analyzed how trust and information interact in inter-organizational relationships, and Dekker (2003, 2004) analyzed control mechanisms in inter-organizational relationships based on a transactions cost economics perspective. This literature has tended to disregard how control of inter-organizational relationships affects or is affected by intra-firm concerns.

However, the intra-organizational control system and the inter-organizational relationship are themselves potentially interrelated. When firms become more interdependent, these relationships potentially have organizational and strategic ramifications. The structure, quality, and level of detail of company cost data are important as it could have potentially has an impact on the optimization of inter-organizational relations. This line of inquiry has been pursued in two separate research streams.

First, a case study approach has investigated relations between the intra- and the inter-organizational in relation to strategies, boundaries, and practices. Mouritsen et al.

(2001) studied how changes in strategies led to implementation of intra-organizational controls, which subsequently had effects on the competencies and strategies of the involved firms. Kajuter and Kulmala (2005) argued that the implementation of open books in the inter-organizational relationship was dependent on the quality of the internal accounting systems. Håkansson and Lind (2004) fleshed out the complex interrelationships between various departments in Ericsson and Telia Mobile, conceptualizing the various control patterns that acted on intra- and inter-organizational relationships. Thrane and Hald (2006) debated the relevance of the concept of inter- vs. intra-organizational relationships and analyzed the dynamic process through which boundaries were shaped by control mechanisms. Carlsson-Wall, Kraus and Lind (2011) investigated how inter-organizational controls and practices were shaped by intra-organizational issues such as the financial situation of the interdependent firms. This literature however does not detail the effect of performance measurement systems on inter-organizational relationships.

The second stream of research has experimentally investigated the relationship between the level of detail of cost information and performance outcomes. Van den Abbeele et al. (2009) analyzed how total cost of ownership (TCO) information affects buyer-supplier negotiations dependent on different power constellations. They found that TCO information is more helpful in negotiations, the less powerful the purchasers are. Drake and Haka (2008) examined the effect of information fineness on the willingness to share this information in buyer-supplier negotiations. Their results showed that sharing fine information leads to higher negotiation efficiencies, but this happens less frequently compared to the sharing of coarse information. Masschelein et al. (2012) found that more precise cost information leads to higher total joint profits in buyer-supplier negotiations and to a higher fairness perception for the seller in cases of the buyer being responsible for the negotiation inefficiency. Wilken et al. (2010) revealed in their studies that the provision of coarse cost information (without direct costs) to vendors leads to higher reservation prices (highest acceptable price for the buyer), higher target prices (best negotiation outcome to be expected), and higher first offers. Furthermore, usage of coarse cost information leads to greater application of attacking negotiation strategies by the vendors, resulting in higher final prices. Finally, Plinke (1985) analyzed buyer-supplier negotiations in the context of capital equipment from the supplier perspective. He demonstrated that the aggregation level of cost

information used by vendors is positively related to the offer price in capital equipment purchasing (CEP). Studies in this field thus focus on the effects of variations in the level of detail of cost information such as fine-grained, Activity based costing or TCO information vs. coarse, or traditional information on negotiations. No study, to our knowledge, focuses on how internal company performance measurement affects inter-organizational relationships.

This paper wishes to further expand and develop our understanding of how inter-organizational relationships are shaped by intra-organizational control systems. Specifically, we are interested in investigating how different measures of procurement performance affect negotiation outcomes, i.e. purchase price and value. For our analysis, we select the context of CEP. In CEP, intra- as well as inter-organizational relationships play an important role, and accounting in CEP is still unexplored. The accounting focus in this research lies on savings measurement for CEP. Savings measurement, the focus of our study, is the predominant performance measure in procurement, but it faces special challenges in CEP. Our primary research question is: "How do intra-organizational control systems affect inter- and intra-organizational negotiations and final price in CEP?" This research question is further operationalized into a number of hypotheses. Furthermore, we focus on success factors in internal and external CEP negotiations and on the evaluation of performance. This is interesting as only a few studies have thus far examined how company-internal managerial accounting affects internal and external negotiations. This topic is regarded as an area that requires more research (Sprinkle, 2003; Sprinkle & Williamson, 2006).

The paper reports on two experiments that examine the research topic. Experiment 1 analyzes CEP negotiations involving purchasers, technicians, and suppliers under the influence of different savings calculation methods. Experiment 2 analyzes the influence of negotiation success on the individual evaluation of CEP projects. The paper's primary contribution is to illustrate how intra- and inter-organizational negotiation outcomes are affected by the chosen intra-organizational performance measures. Furthermore, we develop behavioral and dynamic aspects of the negotiation process and document how making the first offer is paramount in achieving negotiation success and how ambition and a need for power further explain variation in negotiation outcomes. The paper thus illustrates how buyer-supplier negotiations

simultaneously are affected by choice of performance measurement technique, group dynamics and behavioral issues.

In the following, we first provide a background to savings measurement and negotiations for CEP and evaluations of CEP projects, and we develop the hypotheses. Next, we present the methodology of our two conducted experiments. Then the results of the experiments are described. Our paper closes with a summary, a discussion of scientific and managerial implications, limitations, and an outlook.

C.2. Background and hypotheses

C.2.1. Savings measurement for capital equipment purchasing

Theoretical background

Savings measurement is, along with other dimensions (e.g., quality, availability, processes, and supplier performance), an important part of financial procurement performance measurement (Beidelman, 1987). More than 90% of companies apply savings measurement (CAPS Research, 2011; Quitt, 2010), and in most companies, savings are the prevalent performance indicator in procurement (Dumond, 1994).

In business practice, various methods are used to calculate savings in different purchasing circumstances. All methods compare an actual paid price with an appropriate reference price. The calculation methods can be categorized by degrees of cost-effectiveness in cost change and cost avoidance measures. Cost change measures compare the actual paid price of purchased goods or services at different points of time (Monczka et al., 2002). Typical examples of cost change reference prices are previous paid prices that can be adjusted to market index and to purchasing volume developments (Monczka et al., 2002; Smeltzer & Manship, 2003). A cost avoidance reference price is a hypothetical price that might have occurred if the buying company had not taken countermeasures (Monczka et al., 2002; Smeltzer & Manship, 2003). Commonly used cost avoidance measures are the following: catalog prices, planned prices (e.g., budget), target prices, average offers, offers of the selected supplier, and prices paid by other plants or business units (Monczka et al., 2002; Smeltzer & Manship, 2003).

Savings measurement for CEP faces some special challenges, such as missing reference prices. Because capital equipment is not purchased frequently in many cases, the most common reference prices – previous paid prices – are not available. Furthermore, in many cases, capital equipment are customized products, so catalog prices are also unavailable. This leads to the question of an appropriate savings calculation method to be used for CEP.

Further challenges involve, for example, difficulties making a holistic judgment of CEP projects and the manipulation of the savings measures (Maucher & Hofmann, 2013). For example, purchasers sometimes ask potential suppliers for a higher initial offer to improve their "negotiation success", thereby raising their savings.

Another behavior-specific challenge in savings measurement for CEP is the influence of the applied calculation method on supplier selection and negotiation success. Because different calculation methods incentivize different behavior, we expect the applied method to influence the weighting of qualitative and monetary criteria in CEP supplier selection negotiations, the final price in CEP, and the negotiation success in CEP.

Practical background

To ensure closeness to reality, the hypotheses development and the design as well as the procedure of the experiment are derived from corporate practice. We conducted case study research prior to the experiment, focusing on performance and on savings measurement for CEP. Cases were selected applying variation strategy on the company level and on the level of the individual interviewee (Flyvbjerg, 2006; Holschbach & Hofmann, 2011). In total, we selected 18 companies from different industries, with different relative and absolute importance of CEP and different kinds of savings measurement for CEP (Table C-15). Furthermore, interviewees from different company functions were selected (Table C-16). Data collection was primarily carried out by semi-structured face-to-face interviews, using an interview guideline focusing on CEP and savings measurement for CEP. The interviews were mainly recorded on tape, and the transcripts were verified by the respondents. In total, 24 interviews with 32 respondents were conducted from summer 2011 to spring 2012 in Germany, Switzerland, and the United States. In addition, internal company documents such as guidelines to calculate savings, organization charts, and sample

savings calculations were analyzed. To analyze the gathered information, qualitative data analysis was applied (Miles & Huberman, 1994).

The major results of our analysis are the CEP savings calculation methods used in corporate practice. If historical and catalog prices are not available, the case companies calculate savings for CEP as the difference between:

- the initial and final offer from the chosen supplier (price quotation method – single initial offer, PQM-SIO);
- the offer after the technical discussion and the final price with the chosen supplier (price quotation method – single technically validated offer);
- the average of the n (e.g., three) cheapest offers meeting the requirements and the final price (price quotation method – average offer);
- the lowest final offer of a new supplier and the lowest final offer of an established supplier (price quotation method – single offer from an established supplier);
- the planned CEP budget and the final offer from the chosen supplier (budget comparison method, BCM); and
- the calculated value and the final price (value analysis approach). To calculate the value of capital equipment, reference prices for each major component are determined. These can be historical prices, adapted historical prices, or estimations.

In theory, all savings measures can also be calculated using TCO, which includes all costs related to acquisition (e.g., acquisition price, transaction, freight), possession (e.g., storage, interests), usage (e.g., energy, maintenance, repair, and operations), and disposal of a particular good (Ellram, 1995). However, from the case study companies, only four companies partially considered TCO in the savings calculation. The calculation methods applied by most companies are PQM (39% of the companies) and BCM (22%). We therefore chose to focus on these two performance measures.

Hypotheses

Typically, the CEP process consists of these steps: (1) demand assessment, (2) specification of requirements, (3) procurement market research, (4) request for quotation, (5) preliminary selection of quotations, (6) award negotiations, (7) award

decision, (8) contract drafting and ordering, (9) order monitoring, (10) monitoring delivery and release, (11) organization of start-up and test operation, (12) delivery acceptance, (13) support of maintenance, and (14) repair and disinvestment (Hofmann et al., 2012). In this process, the purchaser and the technician must first agree on a preferred supplier. In most cases, technicians try to select a high quality offer. In the second main step, the purchaser negotiates the final price with the preferred supplier. Prior research shows that the reward structure has an influence on the negotiation orientation and on the negotiator's behavior. For example, short-term incentives are more likely to engender short-term behavior and competitive negotiations (Brooks & Rose, 2004). Therefore, we attempt to analyze how the savings calculation method used influences company-internal and company-external CEP negotiations.

In our study, we focus on investigating the PQM-SIO and BCM, as the most common savings calculation methods for CEP.

In the BCM, purchasers are evaluated based on the difference between the planned budget and the final price. This involves company-internal negotiations with technicians and company-external negotiations with the supplier. In the company-internal negotiation, purchasers should therefore try to select the cheapest possible offer. When applying PQM-SIO, purchasers are evaluated based solely on the negotiation success with the selected supplier (Figure C-1).

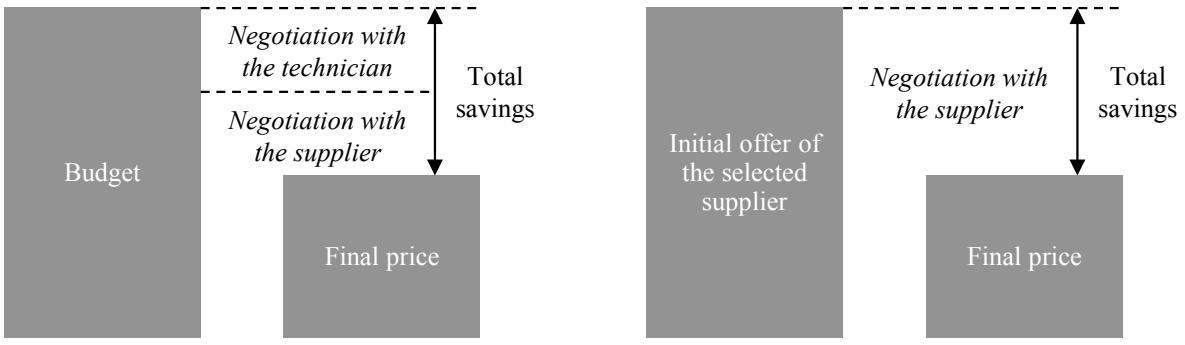

Figure C-1: Savings calculation in the case of the price quotation method – single initial offer and the budget comparison method

In the PQM-SIO method purchasers are not rewarded for securing a cheaper offer through price / quality tradeoffs whereas purchasers in the case of BCM are rewarded

for both success in negotiations with technicians (about price / quality tradeoffs) and through success in negotiations with suppliers. This leads to the following hypotheses:

- H1a: When applying PQM-SIO in CEP, more expensive offers and higher quality offers are selected, compared to BCM.

Second, we analyze how the used savings calculation method influences the negotiation success in CEP. Concerning negotiations, both methods incentivize high negotiation success with the supplier. However, the analyzed methods differ in terms of goals and burden for negotiations with the supplier. When using PQM-SIO, the goal is simpler (high negotiation success with the supplier), and the burden is lower (focus on negotiation with the supplier). As opposed to this, BCM is associated with multiple goals (joint selection, a cheap offer with the technician, and high negotiation success with the supplier), implying a higher burden (focus on both negotiations). Psychological literature shows that multiple goals can complicate managers' decision-making, requiring more time and effort and thus having a negative effect on managers' performance (Emsley, 2003). Barron and Harackiewicz (2001) prove that multiple goals also adversely affect negotiation performance. Furthermore, more stress (e.g., through focus on more negotiations) also leads to lower negotiation performance (O'Connor et al., 2010). This results in the following hypothesis:

- H1b: When applying PQM-SIO in CEP, purchaser's performance in supplier negotiations is higher compared to BCM.

Third, we analyze how the used savings calculation method influences the final price in CEP. We expect the selection of more expensive offers when using PQM-SIO (H1a). However, we expect higher discounts associated with PQM-SIO (H1b). Because these influences have a contradictory effect on final price, we cannot formulate a hypothesis to this question.

C.2.2. Negotiations in capital equipment purchasing

Theoretical background

In CEP especially, personal negotiations play an important part (Newman & Simkins, 1998). These negotiations involve both company internal negotiations between purchasers and representatives of the specialty department (technicians) and external

negotiations between purchasers and suppliers. In comparison to the purchasing of other goods and services, negotiations in CEP are associated with special challenges, such as high financial stakes (Burt et al., 2003; Leenders et al., 2009; Monczka et al., 2002; Talluri, 2002) and the prerequisite of technical expertise (Fearon et al., 1992).

Practical background

The case study also reveals findings concerning negotiations in CEP. Negotiations take place especially during offer selection and award negotiations. Offer selection is mostly done by procurement, together with the specialty department (50%). But in 25% of the companies, offer selection is done by one or the other, either by procurement or by the specialist department (technicians). Subsequent to the preliminary offer selection, award negotiations with the selected suppliers are conducted. Typically, negotiations with one to three suppliers are carried out. In 44% of the cases, award negotiations are conducted either by procurement or by procurement together with the specialty department. Only in some smaller companies (12%) is the specialty department alone responsible for supplier negotiations. The budget size is derived from offers, historical prices, internal company planning, or internal negotiations between the involved organizational units. These findings are used for the subsequent design and procedure of the experiment.

Furthermore, the study shows that the negotiation success in CEP is influenced by several company-specific CEP characteristics, such as the academics ratio and the further education of purchasers concerning CEP. This leads to the question of success factors in CEP negotiations.

Hypotheses

We try to examine key success factors in CEP negotiations. Making the first offer is a major success factor in negotiations. Previous research revealed a positive correlation between the making of initial offers and the final results (Buelens & van Poucke, 2004; Galinsky & Mussweiler, 2001; van Poucke & Buelens, 2002). Thereby, initial offers act as anchors. The anchoring effect involves the influence of initially presented values (anchors) on individuals' judgments (Tversky & Kahneman, 1974). Anchors serve as reference points to narrow down the range of plausible values (Furnham & Boo, 2011). We assume that the anchoring effect also takes place in CEP negotiations. This leads is to the following hypothesis.

- H2: Making the first offer in the negotiation has a positive influence on the outcome of negotiations in CEP.

C.2.3. Evaluation of capital equipment purchasing projects

Theoretical background

Subsequent to the completion of CEP projects, the outcomes must be evaluated by the superiors. In the holistic evaluation of CEP projects, several performance measures have to be considered. Because these measures have to be weighted, a holistic evaluation of the CEP performance largely depends on individual judgment.

Prior experimental research on the evaluation of performance measures and accounting information shows that in the holistic evaluation of several performance measures, the individual measures are not weighted equally (e.g., Banker et al., 2004; Cheng & Humphreys, 2012; Dilla & Steinbart, 2005; Lipe & Salterio, 2000; Lipe & Salterio, 2002). For example, Lipe and Salterio (2000) found that the superiors' evaluations of balanced scorecards is affected only by common measures, not by unique measures.

Practical background

The described case study also analyzed the topic of the evaluation of CEP projects. In most cases, several performance measures are reported for CEP, such as price, savings, quality, and project scheduling. These different performance measures cannot be aggregated to a key performance indicator, as qualitative, quantitative, and monetary dimensions are involved. Therefore, a major challenge identified during the case study is that if several performance dimensions are reported, the evaluation of CEP projects largely depends on individual judgment (Maucher & Hofmann, 2013).

Among the reported performance dimensions, negotiation success is regarded especially critically by many companies. This attitude was explained by the interviewee from company MF8: “For example, a purchaser has a good relationship with the supplier and tells him to raise the first offer by € 1 million and the final offer is on a realistic level. That means one can say that, if a purchaser gets along with suppliers, they automatically attain negotiation success. That is the reason why we exclude the negotiation success.”

Hypotheses

In our research, we analyze the influence of the negotiation success in the evaluation of CEP projects. From a logical point of view, the negotiation success should not be taken into account in the evaluation of CEP projects, because in comparison to other projects, only the final price and qualitative aspects (e.g., user value) determine the CEP performance. It does not matter from which initial offer the final price was obtained, because this can easily be influenced by the purchaser.

This problem is also known from marketing literature. Retailers have developed different reference prices, such as list prices, cost, market value, rival prices, and former prices (Lindsey-Mullikin & Petty, 2011). Reference prices increase consumers' estimates of the savings related to the offered product (Blair & Landon, 1981). Thus, exaggerated reference prices have the same effects as plausible reference prices (Urbany et al., 1988). Retailers respond to this effect by referring to fictitious reference prices when advertising, and they try to deceive the consumers (Kaufmann et al., 1994).

The effect of reference prices on the perceived savings can be explained by the contrast effect. The contrast effect describes the effect in which human judgments are displaced in the direction away from an anchor stimulus if the anchor is placed at increasing distances from the perception (Sherif et al., 1958). A popular example of the contrast effect is the influence of an extremely attractive woman functioning as a prior stimulus on the judgments of other females' average attractiveness (Kenrick & Gutierres, 1980). The contrast effect can also influence accounting judgments (Bhattacharjee et al., 2007).

In our analysis, we expect to find corresponding results in marketing literature. In the evaluation of CEP projects, the difference between reference and final prices has a positive influence on the CEP judgment. This discussion leads us to the subsequent hypothesis:

- H3: When CEP projects with the same user value and same final price are being evaluated, the projects with a higher negotiation success are more positively evaluated.

C.3. Experimental method

To test the hypotheses, we conducted two experiments. Experiment 1 dealt with savings measurement for CEP and negotiations in CEP, and it allowed us to test H1a, H1b, and H2. Experiment 2 concerned the evaluation of CEP projects, and it addresses H3.

In each of the two experiments, 114 bachelor and master students participated. The students were, on average, 24 years old and had been studying an average of 2.5 years. Men and women were about equally represented (52% male, 48% female). About two-thirds of the participants studied economics. The participants were recruited via an online recruitment system for economic experiments (Greiner, 2004). The two experiments took place consecutively with the same participants in the Laboratory for Experimental Research (LERN) at the University of Erlangen-Nuremberg (Germany) in September and October 2012. Every participant received a performance-related payment for both experiments as well as a show-up payment (€ 2.50). Pilot tests were conducted prior to the final execution of the experiments in the LERN.

C.3.1. Experiment 1

Design

We used experiment 1 to analyze savings measurement and negotiations in CEP. The experiment employed a within subjects design with two treatments. In treatment 1, the PQM-SIO was applied to calculate savings. Treatment 2 used the BCM to measure savings. In our analysis of savings measurement, we used the savings calculation method as the independent variable. Dependent variables were price and quality of the selected offer as well as the purchaser's negotiation success (discount granted). Concerning CEP negotiations, we selected the subject's role in CEP (purchaser, technician, or supplier) and the frequency with which subjects made first offers as independent variables. The dependent variable in this context was the negotiation success of all roles.

Procedure

The participants were randomly assigned to one of the three possible roles (purchaser, technician, or supplier). Then the task and the payment scheme were explained

separately for each group in different rooms. The two treatments were conducted consecutively, and each treatment consisted of three rounds. For each round, a specific technician and supplier were allocated to each purchaser. Each experiment took place with 21 or 24 participants coincident, so purchasers never had the same negotiation partners twice in the experiment. Initially, each purchaser and technician pair had to agree on one of the possible offers displayed in Table C-1. The selected width of the price range (50%) was received from a German excavator producer, which conducted a study on this topic. The study involves all relevant excavator producers worldwide.

Table C-1: Possible offers to be selected

Offer	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Supplier's initial offer	€ 800.0 K	€ 844.5 K	€ 889.0 K	€ 933.5 K	€ 978.0 K	€ 1,022.0 K	€ 1,066.5 K	€ 1,111.0 K	€ 1,155.5 K	€ 1,200.0 K
User Value	60.0%	64.4%	68.9%	73.3%	77.8%	82.2%	86.7%	91.1%	95.6%	100.0%

Subsequently, purchasers had to negotiate the final price of the selected offer with the assigned supplier for the specific round. The assignment of the supplier was independent from the offer selection. Suppliers could give a discount on the initial offer. The results of the negotiations (selected offer and final price or no agreement) were set down in written results documentation and signed with individual stickers. For each negotiation, there was a time limit of three minutes, following prior similar experiments (e.g., Davis & Holt, 1993; Harrison & McKee, 1985; Wang, 2010). In corporate practice also, negotiations normally are conducted under time pressure (Davis & Holt, 1993). Furthermore, a given time limit avoids differences in time pressure for the participants because of possible follow-up appointments, and it leads to consistent average hourly payment (Harrison & McKee, 1985). This procedure was repeated in each round with different negotiation partners.

The payment scheme was different for each group. In treatment 1, purchasers were paid according the PQM-SIO. Purchasers received € 1 for each percent of price discount, to a maximum of € 10. In treatment 2, purchasers were paid according to the BCM. The payment was calculated as the difference between the given budget (€ 1,200,000) and the final price.

$$payment\ [€] = \frac{1{,}200{,}000 - final\ price}{55{,}000} \quad (1)$$

Additionally, purchasers had a budget of € 3,400,000 for the three rounds of each treatment. If they exceeded the budget, they did not receive any payment for this treatment. In each treatment, one of the three rounds was compensated. The round to be compensated was randomly determined after the experiment This procedure was selected to ensure high motivation of the participants in each round (Blumkin et al., 2012). In both treatments, attained savings and the payment correlated linearly.

For technicians and suppliers, the payment schema did not change in the two treatments. For these groups, one of the six rounds was randomly selected after the experiment and was compensated. Technicians were paid based on the user value of the selected offer, with a maximum payment of € 20.

$$payment\ [€] = (user\ value - 60\%) \times € 45 \quad (2)$$

The supplier's payment was calculated based on the given percentage discount to the purchaser. The suppliers lost € 2 for each percent of given discount from their maximum payment of € 20.

$$payment\ [€] = € 20 - (given\ discount[\%] \times € 2) \quad (3)$$

If the negotiation partners did not agree within the time limit, neither participant received a payment for this round. The participants were not allowed to inform their negotiation partners about their payment scheme. Had this occurred, they would have been disqualified from the experiment without payment. Apart from this constraint, free communication (also known as unstructured bargaining) was allowed during the negotiations (e.g., Wang, 2010). Thereby, the detailed negotiation procedure (e.g., order of offers, type of reasoning, nonverbal communication, etc.) was not defined by the conductor of the experiment. The outcomes in experiments applying unstructured bargaining are regarded as more realistic and not influenced by electronic devices (Camerer, 2003; Wilken et al., 2010). The average performance-related payment in experiment 1 was € 10.30.

In general, problem solving negotiations (cooperative "win-win-situation") and distributive negotiations (competitive "win-lose-situation") are distinguished (Campbell et al., 1988; Walton & McKersie, 1966). Because the total payment for each negotiation was fixed, our experiment applied a distributive negotiation. Following the experiment, participants had to fill out a questionnaire. The

questionnaire contained questions concerning personal data (role in experiment 1, age, sex, subject, number of semesters, etc.), self-evaluations (performance in experiment 1, ambition, needs, etc.), and the number of rounds in which they made the first offer.

C.3.2. Experiment 2

Design

Experiment 2 was used to analyze the evaluation of CEP projects and to test H3. Similar to experiment 1, experiment 2 used a within subjects design with two treatments (low and high negotiation success). The independent variable in this experiment was the negotiation success, and the project evaluation of the participants served as the dependent variable.

Procedure

The task for the participants was to evaluate eight CEP projects from the procurement viewpoint. All CEP projects involved the same product category of capital equipment. The evaluation was based on the information displayed in Table C-2. The participants had five minutes to evaluate the eight projects.

Projects 2 and 5 had the same user value (3.5) and the same final price (€ 1,068,019), but different negotiation success (7% and 3%). Because the participants had to evaluate a total of eight projects, and these two projects were not directly one after the other in the table, we did not expect the participants to directly compare project 2 with project 5.

Table C-2: Capital equipment purchasing projects to be evaluated

Project number	User value	Final price	Negotiation success	Your evaluation [%]
1	2.5	€ 1,236,253	3%	
2	3.5	€ 1,068,019	7%	
3	1.5	€ 872,193	3%	
4	5.0	€ 1,175,227	0%	
5	3.5	€ 1,068,019	3%	
6	1.0	€ 1,050,257	7%	
7	2.0	€ 1,162,924	3%	
8	3,0	€ 915.445	3%	

The following information related to Table C-2 was given to the participants:

- User value: Consists of the capital equipment performance, quality, service quality, and delivery time, and can take values between "1" (very poor) and "5" (very good).
- Final price: Represents the capital equipment price on conclusion of the contract.
- Negotiation success: Results from the percentage difference between the initial supplier offer and the final price.

The evaluation should be done on a scale from 0% to 100% in 5% steps. An average project should be evaluated with 50% (Figure C-2).

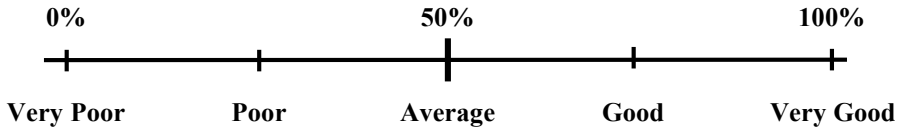

Figure C-2: Evaluation scale

The evaluation of the project results was done by 10 procurement professionals before the experiment. For each project, the arithmetic average of all professional evaluations was calculated. The closer the experiment participants were to the average professional evaluation, the higher the payment (Table C-3). The average performance-related payment in experiment 2 was € 2.40.

Table C-3: Payment scheme

Deviation in percentage points for each project evaluation (A)	Payment for each project evaluation
$A \leq 5\%$	€ 1.00
$5 < A \leq 10\%$	€ 0.50
$10 < A \leq 15\%$	€ 0.20
$A > 15\%$	€ 0.00

C.4. Results

C.4.1. Savings measurement for capital equipment purchasing

In experiment 1, we first analyzed the influence of the applied savings calculation method (PQM-SIO or BCM) on the selected offer, which directly affected the initial offer price and the user value. In each treatment, purchasers and technicians selected 112 offers in three rounds. In two negotiations in the BCM-treatment, the negotiation partners could not agree on one offer. The average selected offer number was 7.42 when applying PQM-SIO and 6.47 in the case of BCM (Table C-4). The average initial offer price was € 1,085,232.14 in PQM-SIO and € 1,043,209.82 in BCM, and the average user value was 88.5% in PQM-SIO and 84.3% in BCM.

Table C-4: H1a – paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Selected offer PQM-SIO	7.42	112	1.625	.154
	Selected offer BCM	6.47	112	1.692	.160
Pair 2	Initial offer price PQM-SIO	1,085,232.14	112	72,226.680	6,824.780
	Initial offer price BCM	1,043,209.82	112	75,135.033	7,099.593
Pair 3	User value PQM-SIO	.88531746040	112	.072242844357	.006826307149
	User value BCM	.84325396834	112	.075216768995	.007107316614

The paired samples t-test revealed statistically significant differences between PQM-SIO and BCM relating to the selected offer ($t = 4.48$, $df = 111$, $p = .000$), the initial offer price ($t = 4.47$, $df = 111$, $p = .000$), and the user value ($t = 4.48$, $df = 111$, $p = .000$) (Table C-5). Thus, our results provide strong support for H1a, confirming that when applying PQM-SIO in CEP, more expensive offers and offers with higher quality are selected compared to offers selected when applying BCM.

Table C-5: H1a – paired samples test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
Pair 1	Selected offer PQM-SIO - Selected offer BCM	0.946	2.237	0.211	0.527	1.365	4.48	111	.000
Pair 2	Initial offer price PQM-SIO - Initial offer price BCM	42,022.321	99,392.624	9,391.72	23,412.001	60,632.642	4.47	111	.000
Pair 3	User value PQM-SIO - User value BCM	0.04206349	0.09944153	0.00939634	0.02344401	0.06068297	4.48	111	.000

Furthermore, we analyzed purchasers' performance in price negotiations with suppliers. In 111 negotiations, purchasers and suppliers agreed on a final price. Apart from the two inconclusive negotiations between purchasers and technicians, purchasers and suppliers did not agree on a final price in 14 negotiations, resulting in 100 completed negotiations. When applying PQM-SIO, the average price discount was 3.4% compared to 3.2% for the case of BCM (Table C-6).

Table C-6: H1b – paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Discount PQM-SIO	.03374666234	100	.021693463414	.002169346341
	Discount BCM	.03176931647	100	.013846454721	.001384645472

However, the difference is not statistically significant (Table C-7). Therefore, H1b needs to be rejected.

Table C-7: H1b – paired samples test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Discount PQM-SIO - Discount BCM	.001977346	.020985947	.002098595	-.00218672	.00614141	.942	99	.348

Finally, we analyzed how the savings calculation method that was used influences the final price in CEP and found that the average final price in PQM-SIO (€ 1,053,347.02) is higher than in BCM (€ 1,012,846.93) (Table C-8).

Table C-8: Final price – paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Final price PQM-SIO	1,053,347.02	100	71,226.0173	7,122.6017
	Final price BCM	1,012,846.93	100	76,866.0179	7,686.6018

This difference is significant (t = 4.401, df = 99, p = .000) (Table C-9). The reason for this result is the strong influence of the selected offer (H1a) and the weak influence of the price discount (H1b) dependent on the applied savings calculation method.

Table C-9: Final price – paired samples test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Final price PQM-SIO - Final price BCM	40,500.0850	92,015.3331	9,201.5333	22,242.2466	58,757.9234	4.401	99	.000

C.4.2. Negotiations in capital equipment purchasing

Concerning negotiations in CEP, we analyzed the effect of making the first offer on the negotiation success. The calculation of the purchasing success is guided by the payment calculation. However, in this calculation, we considered all six rounds, and the result was expressed as a percentage. The total negotiation success was calculated as the mean negotiation success of each round, according to the following schemes (minimum value 0%, maximum value 100%):

- Purchaser PQM-SIO:

$$\text{negotiation success [\%]} = \text{attained discount [\%]} \times 10 \quad (4)$$

attained discount = 0% → *negotiation success = 0%*

attained discount = 10% → *negotiation success = 100%*

- Purchaser BCM:

$$\text{negotiation success [\%]} = 2.5 - \frac{\text{final price [€]}}{€\ 480{,}000} \quad (5)$$

final price = € 1,200,000 → *negotiation success = 0%*

final price = € 720,000 → *negotiation success = 100%*

- Technician:

$$\text{negotiation success [\%]} = \frac{\text{selected offer}}{9} - \frac{1}{9} \quad (6)$$

selected offer = 1 → *negotiation success = 0%*

selected offer = 10 → *negotiation success = 100%*

- Supplier:

$$\text{negotiation success [\%]} = (0.1 - \text{given discount [\%]}) \times 10 \quad (7)$$

given discount = 10% → *negotiation success = 0%*

given discount = 0% → *negotiation success = 100%*

H2 states that making the first offer in the negotiation has a positive influence on the outcome of negotiations in CEP. Because the average negotiation success differs significantly depending on the role in the experiment (purchaser, supplier, technician), we considered the negotiation success within the role group for this analysis. For this purpose, we determined – for each participant – whether the individual negotiation success was above or below the average negotiation success of the respective group. The number of rounds where participants made the first offer was ascertained by the questionnaire. The mean number of first offers is 3.5 in the above-average group and 2.9 in the below-average group (Table C-10).

Table C-10: H2 – means and standard deviations

Negotiation success		N	Mean	Std. Deviation	Std. Error Mean
Number of first offers	Above average	42	3.488	1.6766	.2587
	Below average	47	2.894	1.6581	.2419

According to the t-test, this difference is significant at a 10% level (p = .097), which supports H2 (Table C-11).

Table C-11: H2 – independent samples t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Number of first offers	Equal variances assumed	.102	.750	1.68	87	.097	.5945	.3539	-.1090	1.2979
	Equal variances not assumed			1.68	85.664	.097	.5945	.3541	-.1096	1.2985

C.4.3. Evaluation of capital equipment purchasing projects

We also analyzed the effect of the negotiation success in the evaluation of CEP projects, comparing the participants' evaluation of project 2 and project 5 in Table C-2. As expected, 81% of the participants evaluated project 2 more positively than project 5. On average, project 2 was evaluated 11.8 percentage points more positively than project 5 (Table C-12).

Table C-12: H3 – paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Evaluation project 2	.7882	114	.14759	.01382
	Evaluation project 5	.6702	114	.15624	.01463

This difference is significant (p = .000) and therefore supports H3 (Table C-13).

Table C-13: H3 – paired samples test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Evaluation project 2 - Evaluation project 5	.11798	.15715	.01472	.08882	.14714	8.016	113	.000

In order to calculate the participants' payment for experiment 2, 10 procurement professionals conducted the same experiment without payment. Also in this group, 90% evaluated project 2 more positively than project 5. The average evaluation difference was 18.0%. Because of the small sample of procurement professionals, we did not analyze the significance of this result.

C.4.4. Supplemental analyses

In addition to the tests of deduced hypotheses, we applied further analysis of the gathered data.

First, we find that purchasers are less successful in CEP negotiations with technicians and suppliers than are their negotiating partners. The results provided in Table C-17 show that the average purchasers' negotiation success (33.9%) is much lower than suppliers' (65.0%) and technicians' negotiation success (66.3%). We tested these differences with an ANOVA, which indicates significant differences ($F = 105.61$, $p = .000$) (Table C-18).

Additionally, we searched for further success factors in CEP negotiations. Thereby, we found that the number of semesters ($p < 0.01$), ambition ($p < 0.05$), and the need for power ($p < 0.05$) have a positive effect on the CEP negotiation success (Table C-19, Table C-20). Concerning other participants' characteristics (age, sex, subject, risk disposition, need for recognition, honor, vengeance, and saving), we did not find any correlations with the CEP negotiation success.

Furthermore, we analyzed whether the role in experiment 1 influenced the behavior in experiment 2 and found that the evaluation difference between project 2 and 5 differs depending on the role in experiment 1. As displayed in Table C-21 and Table C-22, this difference was significantly ($p < 0.05$) lower in the technicians group (6.6%) than in the purchasers (13.0%) and the suppliers groups (15.8%).

Finally, we analyzed correlations between the individual evaluation of each project and the given information (user value, final price, negotiation success), as well as final price-user value-quotient (Table C-23). The strongest correlation existed between the evaluation and the user value (0.41) as well as between the evaluation the final price-user value-quotient (0.41). Concerning the different role groups, we found notable differences in correlations between the participants' evaluation and user value. The technicians' correlation (0.526) was much higher than the purchasers' (0.329) and suppliers' correlations (0.380). A Fisher's z-transformation (Table C-24) revealed that the correlation of technicians differed significantly from the correlations of purchasers ($p = 0.003$) and suppliers ($p = 0.024$).

C.5. Discussion

In this paper, we investigate effects of intra-organizational control systems on inter- and intra-organizational relationships. The results of our experiments largely support our formulated hypotheses and reveal further insights. In the following, these results will be discussed.

The applied performance calculation method has a strong influence on inter- and intra-organizational negotiations. When applying PQM-SIO, the selected offers were, on average, 4.3% more expensive than BCM. We find that using budgets as reference prices leads to lower purchasing costs, which is not surprising. However, the purchasers' behavior in the negotiations with the technicians was not completely rational. When applying PQM, it would have been sufficient for purchasers to agree, on average, on offer 8.5 to meet the three-rounds-budget of € 3,400,000. The selection of a cheaper offer does not lead to a higher payment for purchasers, but it leads to a lower payment for technicians in our experiment. However, the results show that on average, offer number 7.4 was selected. This result indicates that even if a better negotiation outcome does not lead to a higher payment, participants try to attain a

better result. It could be that the subjects might not have properly understood the experimental task. However, it is known that outcomes in experiments applying unstructured bargaining are difficult to predict (Camerer, 2003). Furthermore, the experimental tasks in both treatments had been explained carefully and separately to the participants. The calculation of the payments was elucidated by means of concrete examples. Participants also used opportunities to ask questions concerning the task and the payment scheme. A possible explanation for the observed behavior could therefore be that negotiations are perceived as competitions, with a performance increasing effect, although this behavior is not incentivized by the payment scheme. The distributive negotiation seems to be an intrinsic motivation for the purchasers (Herzberg, 1968). However, if a better negotiation outcome leads to a higher payment, the results are even better. Furthermore, we find that the purchaser's negotiation performance in negotiations with suppliers is only slightly better in PQM-SIO when compared to BCM. Therefore, the existence of multiple goals for purchasers in CEP seems to have little influence on the outcome of negotiations. Because of this, the final price in our experiment is mainly influenced by the offer selection and was thus higher when applying PQM-SIO.

The results have several theoretical implications. We show that not only cost information (cf. Masschelein et al., 2012; Plinke, 1985; van den Abbeele et al., 2009; Wilken et al., 2010) and other intra- and inter-organizational controls (cf. Carlsson-Wall et al., 2011; Mouritsen et al., 2001) have an influence on inter- and intra-organizational negotiations, but that performance measurement also does. The influence seems to be even stronger because performance measurement also influences CEP negotiation in the case of distributive bargaining, where TCO information has no effect (van den Abbeele et al., 2009).

These results have several managerial implications for the design of intra-organizational control systems. First, it should be considered that the applied savings calculation method has an influence on the offer selection and on the final price in CEP. Applying BCM leads to lower costs in CEP. Second, the results indicate that savings in CEP can be influenced mainly in offer selection and not in negotiations. Thus, procurement attention should be placed primarily on the specification of requirements and on offer selection in CEP.

Concerning success factors of CEP negotiations, we show that making the first offer in a CEP negotiation has a positive influence on the outcome of the negotiation. Despite the special characteristics of CEP negotiations, this general phenomenon is also valid for CEP. Additionally, our results show that purchasers' negotiation success is much lower than that of suppliers and technicians. A possible explanation could be that purchasers have to conduct negotiations with technicians and suppliers in CEP, and therefore, they have a higher burden in negotiation, leading to a lower negotiation success (O'Connor et al., 2010). In contrast, technicians and suppliers can zero in on their negotiations with purchasers. Furthermore, it is conspicuous that the average discount amounts to about 3%, although discounts between 0% and 10% were theoretically possible for purchasers and suppliers. It seems that many participants considered 3% a fair discount because this percentage is often used in corporate practice, e.g., as a cash discount for prompt payment, and that therefore it served as an anchor. Actually, 5% would have been the real fair discount, where both parties would have shared the payment equally. Table C-14 shows an overview of the theoretical equilibriums and experiment results in experiment 1.

The theoretical implications of these results imply that a general success tactic in negotiations of making the first offer is also helpful for the context of CEP negotiations. We also show that anchors play an important role in CEP (cf. Tversky & Kahneman, 1974). Furthermore, the findings provide the basis for some practical recommendations. Purchasers should try to split internal and external negotiations and should prepare each negotiation without time pressure. However, according to motivation theory, this measure might have negative consequences for the intrinsic motivation (Herzberg, 1968). Furthermore, purchasers should be aware of the 3%-discount-anchor and should not always be satisfied with this discount. Finally, purchasers should be trained to make the first offer in a negotiation.

Our results reveal that the number of semesters, ambition, and the need for power have a positive effect on the CEP negotiation success. Concerning the number of semesters, it seems obvious that students gain more experience during their studies, which also improves their negotiation skills. As opposed to this, age is not correlated to the CEP negotiation success. Furthermore, one could expect that economics students perform better than students in other subjects, but we did not find a significant relation in this point. These results indicate that most subjects help improve the negotiation success. A

possible reason for the correlation between ambition and negotiation success might be that negotiations can be regarded as a kind of competition, whereby ambition helps to obtain better results. Finally, the results show that participants with a strong need for power obtain better results. This result is supported by the achievement motivation theory of McClelland (1961), which states that persons with a strong need for power prefer a power-oriented environment. In this sense, distributive negotiation can be regarded as a power-oriented environment, which leads to better outcomes for participants with a strong need for power. Transferred to corporate practice, these results imply that ambitious purchasers with a strong need for power should be given preference in personnel selection for CEP negotiations.

Table C-14: Theoretical equilibriums and experimental results in experiment 1

	Treatment 1 (PQM-SIO)		Treatment 2 (BCM)	
	Theoretical equilibriums	**Experimental results**	**Theoretical equilibriums**	**Experimental results**
Step 1: offer selection	= (8.5+10) / 2 = 9.25	7,4	= (1+10) / 2 = 5.5	6.5
Step 2: price negotiation	approx. 5% discount	3.4%	approx. 5% discount	3.2%

The results of experiment 2 support our hypothesis that when CEP projects with the same user value and the same final price are being evaluated, projects with a higher negotiation success are more positively evaluated. In evaluating CEP projects, participants fall for the same trick as consumers do with fictitious reference prices. In the corporate practice of CEP, it is relatively easy to obtain a high negotiation success for purchasers. They just have to ask potential suppliers for a higher initial offer to improve their negotiation success. We did not analyze this phenomenon for procurement professionals in a large-scale experiment. However, it seems that they also consider the negotiation success in the evaluation of CEP projects. This result implies an important managerial implication. If more objective information (such as final price and user value) is available when evaluating different CEP projects, superiors should note that negotiation success must not be taken into account.

We also found that participants' role in experiment 1 influenced the evaluation in experiment 2, particularly for technicians. The most important measure for technicians in experiment 1 was the user value, because they were paid on the basis of this

measure. In experiment 2, technicians had the strongest correlation between their evaluation and user value. Additionally, technicians had no connection to the negotiation success in experiment 1, because this value was negotiated between purchasers and suppliers. As a consequence, technicians had the lowest evaluation difference between project 2 and 5 and thus considered the negotiation success in CEP project evaluation the least of all groups.

As a theoretical implication, it can be stated that the effect of fictitious reference prices on perceived savings is not only a phenomenon in marketing but also in procurement. The contrast effect therefore also occurs in the evaluation of purchasing projects. The managerial implication of this result is that superiors who evaluate CEP projects put a higher weighting on criteria they deal with in their daily business. This phenomenon should be considered in the selection of evaluators for CEP projects.

Like all research, our experiments are subject to limitations. First, as with all laboratory experiments, the results depend on the specific experimental design and procedure, such as task, treatments, parameter values, etc. (Fisher et al., 2006). For example, we selected students as subjects in our experiments; most had no professional experience in CEP. According to prior research, students are adequate surrogates in accounting experiments (Liyanarachchi, 2007). However, we cannot be sure whether procurement professionals might have behaved differently. Furthermore, in experiment 1, we selected a within subjects design with two treatments. Because of this, order effects between the two treatments cannot be precluded. Second, CEP is much more complex (more people involved, more selection criteria, longer period, etc.) in corporate practice than in our experiments. Third, we focused on distributive negotiation in CEP and did not analyze problem solving negotiation, which also occurs in certain situations. Fourth, we only analyzed whether statistical relationships exist between different variables. We did not analyze the reasons for these relationships, but only discussed hypothetical reasons.

The limitations of this analysis also provide a basis for further research. For example, experiment 1 could be repeated with the two treatments conducted in a different order or with procurement professionals used as participants. An experiment based on problem solving negotiations could be conducted to increase our understanding of CEP and how company-internal managerial accounting affects negotiations.

Additionally, the CEP negotiations could be conducted more realistically, with several negotiation rounds or group negotiations. Finally, further research should focus on the reasons for the relationships discovered.

References

Banker, R. D., Chang, H. & Pizzini, M. J. (2004). The Balanced Scorecard: Judgmental Effects of Performance Measures Linked to Strategy. The Accounting Review, 79(1), 1-23.

Barron, K. E. & Harackiewicz, J. M. (2001). Achievement Goals and Optimal Motivation: Testing Multiple Goal Models. Journal of Personality and Social Psychology, 80(5), 706-722.

Beidelman, K. (1987). Purchasing and Profit: Contributions worth Measuring. Journal of Purchasing & Materials Management, 23(3), 2-9.

Bhattacharjee, S., Maletta, M. J. & Moreno, K. K. (2007). The Cascading of Contrast Effects on Auditors' Judgments in Multiple Client Audit Environments. The Accounting Review, 82(5), 1097-1117.

Blair, E. A. & Landon, E. L., Jr. (1981). The Effects of Reference Prices in Retail Advertisements. Journal of Marketing, 45(2), 61-69.

Blumkin, T., Ruffle, B. J. & Ganun, Y. (2012). Are Income and Consumption Taxes Ever Really Equivalent? Evidence from a Real-effort Experiment with Real Goods. European Economic Review, 56(6), 1200-1219.

Brooks, B. W. & Rose, R. L. (2004). A Contextual Model of Negotiation Orientation. Industrial Marketing Management, 33(2), 125-133.

Buelens, M. & van Poucke, D. (2004). Determinants of a Negotiator's Initial Opening Offer. Journal of Business and Psychology, 19(1), 23-35.

Burt, D. N., Dobler, D. W. & Starling, S. L. (2003). World Class Supply Management: The Key to Supply Chain Management (7th ed.). New York, NY: McGraw-Hill College.

Caglio, A. & Ditillo, A. (2008). A Review and Discussion of Management Control in Inter-firm Relationships: Achievements and Future Directions. Accounting, Organizations and Society, 33(7–8), 865-898.

Camerer, C. (2003). Behavioral Game Theory: Experiments in Strategic Interaction. Princeton: Princeton University Press.

Campbell, N. C. G., Graham, J. L., Jolibert, A. & Meissner, H. G. (1988). Marketing Negotiations in France, Germany, the United Kingdom, and the United States. Journal of Marketing, 52(2), 49-62.

CAPS Research (2011). Reporting Cost Savings. Tempe, AZ: Center for Advanced Purchasing Studies.

Carlsson-Wall, M., Kraus, K. & Lind, J. (2011). The Interdependencies of Intra- and Inter-organisational Controls and Work Practices – The Case of Domestic Care of the Elderly. Management Accounting Research, 22(4), 313-329.

Cheng, M. M. & Humphreys, K. A. (2012). The Differential Improvement Effects of the Strategy Map and Scorecard Perspectives on Managers' Strategic Judgments. The Accounting Review, 87(3), 899-924.

Cooper, R. & Slagmulder, R. (2004). Interorganizational Cost Management and Relational Context. Accounting, Organizations and Society, 29(1), 1-26.

Davis, D. D. & Holt, C. A. (1993). Experimental Economics. Princeton, NJ: Princeton University Press.

Dekker, H. C. (2003). Value Chain Analysis in Interfirm Relationships: A Field Study. Management Accounting Research, 14(1), 1-23.

Dekker, H. C. (2004). Control of Inter-organizational Relationships: Evidence on Appropriation Concerns and Coordination Requirements. Accounting, Organizations and Society, 29(1), 27-49.

Dilla, W. N. & Steinbart, P. J. (2005). Relative Weighting of Common and Unique Balanced Scorecard Measures by Knowledgeable Decision Makers. Behavioral Research in Accounting, 17(1), 43-53.

Drake, A. R. & Haka, S. F. (2008). Does ABC Information Exacerbate Hold-up Problems in Buyer-supplier Negotiations? The Accounting Review, 83(1), 29-60.

Dumond, E. J. (1994). Moving Toward Value-Based Purchasing. International Journal of Purchasing & Materials Management, 30(2), 2-8.

Ellram, L. M. (1995). Total Cost of Ownership: An Analysis Approach for Purchasing. International Journal of Physical Distribution & Logistics Management, 25(8), 4-23.

Emsley, D. (2003). Multiple Goals and Managers' Job-related Tension and Performance. Journal of Managerial Psychology, 18(4), 345-356.

Fearon, H. E., Dobler, D. W. & Killen, K. H. (1992). The Purchasing Handbook (5th ed.). New York: McGraw-Hill.

Fisher, J. G., Frederickson, J. R. & Peffer, S. A. (2006). Budget Negotiations in Multi-period Settings. Accounting, Organizations and Society, 31(6), 511-528.

Flyvbjerg, B. (2006). Five Misunderstandings about Case-Study Research. Qualitative Inquiry, 12(2), 219-245.

Frances, J. & Garnsey, E. (1996). Supermarkets and Suppliers in the United Kingdom: System Integration, Information and Control. Accounting, Organizations and Society, 21(6), 591-610.

Furnham, A. & Boo, H. C. (2011). A Literature Review of the Anchoring Effect. The Journal of Socio-Economics, 40(1), 35-42.

Galinsky, A. D. & Mussweiler, T. (2001). First Offers as Anchors: The Role of Perspective-taking and Negotiator Focus. Journal of Personality and Social Psychology, 81(4), 657-669.

Greiner, B. (2004). An Online Recruitment System for Economic Experiments. In: K. Kremer & V. Macho (Eds.), Forschung und wissenschaftliches Rechnen 2003 (Vol. GWDG Bericht 63, 79–93). Göttingen: Gesellschaft für Wissenschaftliche Datenverarbeitung.

Håkansson, H. & Lind, J. (2004). Accounting and Network Coordination. Accounting, Organizations and Society, 29(1), 51-72.

Harrison, G. W. & McKee, M. (1985). Experimental Evaluation of the Coase Theorem. Journal of Law and Economics, 28(3), 653-670.

Herzberg, F. (1968). One More Time: How Do You Motivate Employees? Harvard Business Review, 46(1), 53-62.

Hofmann, E., Maucher, D., Hornstein, J. & den Ouden, R. (2012). Capital Equipment Purchasing: Optimizing the Total Cost of CapEx Sourcing. Berlin, Heidelberg, New York: Springer.

Holschbach, E. & Hofmann, E. (2011). Exploring Quality Management for Business Services from a Buyer's Perspective Using Multiple Case Study Evidence. International Journal of Operations & Production Management, 31(6), 648-685.

Kajüter, P. & Kulmala, H. I. (2005). Open-book Accounting in Networks: Potential Achievements and Reasons for Failures. Management Accounting Research, 16(2), 179-204.

Kaufmann, P. J., Smith, N. C. & Ortmeyer, G. K. (1994). Deception in Retailer High-low Pricing: A “Rule of Reason” Approach. Journal of Retailing, 70(2), 115-138.

Kenrick, D. T. & Gutierres, S. E. (1980). Contrast Effects and Judgments of Physical Attractiveness: When Beauty Becomes a Social Problem. Journal of Personality and Social Psychology, 38(1), 131-140.

Langfield-Smith, K. & Smith, D. (2003). Management Control Systems and Trust in Outsourcing Relationships. Management Accounting Research, 14(3), 281-307.

Leenders, M. R., Johnson, P. F., Flynn, A. E. & Fearon, H. E. (2009). Purchasing Supply Management (13th ed.). New York, NY: McGraw-Hill Education.

Lindsey-Mullikin, J. & Petty, R. D. (2011). Marketing Tactics Discouraging Price Search: Deception and Competition. Journal of Business Research, 64(1), 67-73.

Lipe, M. & Salterio, S. (2000). The Balanced Scorecard: Judgmental Effects of Common and Unique Performance Measures. The Accounting Review, 75(3), 283-298.

Lipe, M. G. & Salterio, S. (2002). A Note on the Judgmental Effects of the Balanced Scorecard's Information Organization. Accounting, Organizations and Society, 27(6), 531-540.

Liyanarachchi, G. A. (2007). Feasibility of Using Student Subjects in Accounting Experiments: A Review. Pacific Accounting Review, 19(1), 47-67.

Masschelein, S., Cardinaels, E. & Abbeele, A. v. d. (2012). ABC Information, Fairness Perceptions, and Interfirm Negotiations. The Accounting Review, 87(3), 951-973.

Maucher, D. & Hofmann, E. (2013). Savings Measurement for Capital Equipment Purchasing: Challenges and Conceptual Model (forthcoming). International Journal of Productivity and Performance Management.

McClelland, D. C. (1961). The Achieving Society. Princeton: Van Nostrand.

Miles, M. B. & Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. London: Sage Publications.

Monczka, R. M., Trent, R. J. & Handfield, R. B. (2002). Purchasing and Supply Chain Management (2nd ed.). Cincinatti, OH: South-Western College Pub.

Mouritsen, J., Hansen, A. & Hansen, C. Ø. (2001). Inter-organizational Controls and Organizational Competencies: Episodes around Target Cost Management/functional Analysis and Open Book Accounting. Management Accounting Research, 12(2), 221-244.

Mouritsen, J. & Thrane, S. (2006). Accounting, Network Complementarities and the Development of Inter-organisational Relations. Accounting, Organizations and Society, 31(3), 241-275.

Newman, R. G. & Simkins, R. J. (1998). Capital Equipment Buying Handbook. New York, NY: Amacom.

O'Connor, K. M., Arnold, J. A. & Maurizio, A. M. (2010). The Prospect of Negotiating: Stress, Cognitive Appraisal, and Performance. Journal of Experimental Social Psychology, 46(5), 729-735.

Plinke, W. (1985). Cost-based Pricing: Behavioral Aspects of Price Decisions for Capital Goods. Journal of Business Research, 13(5), 447-460.

Quitt, A. (2010). Measuring Supply Management's Budget Effects: Introduction of Return on Spend as an Indicator of Supply Management's Financial Effectiveness. Diss., European Business School, Oestrich-Winkel.

Sherif, M., Taub, D. & Hovland, C. I. (1958). Assimilation and Contrast Effects of Anchoring Stimuli on Judgments. Journal of Experimental Psychology, 55(2), 150-155.

Smeltzer, L. R. & Manship, J. A. (2003). How Good Are Your Cost Reduction Measures? Supply Chain Management Review, 7(3), 28-33.

Sprinkle, G. B. (2003). Perspectives on Experimental Research in Managerial Accounting. Accounting, Organizations and Society, 28(2–3), 287-318.

Sprinkle, G. B. & Williamson, M. G. (2006). Experimental Research in Managerial Accounting. In: C. S. Chapman, A. G. Hopwood & M. D. Shields (Eds.), Handbooks of Management Accounting Research (Vol. 1, 415-444). Amsterdam: Elsevier.

Talluri, S. (2002). Single Price System Model for Optimal Decisions in Capital Equipment Purchasing. International Journal of Production Research, 40(4), 1003-1016.

Thrane, S. & Hald, K. S. (2006). The Emergence of Boundaries and Accounting in Supply Fields: The Dynamics of Integration and Fragmentation. Management Accounting Research, 17(3), 288-314.

Tomkins, C. (2001). Interdependencies, Trust and Information in Relationships, Alliances and Networks. Accounting, Organizations and Society, 26(2), 161-191.

Tversky, A. & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. Science, 185(4157), 1124-1131.

Urbany, J. E., Bearden, W. O. & Weilbaker, D. C. (1988). The Effect of Plausible and Exaggerated Reference Prices on Consumer Perceptions and Price Search. Journal of Consumer Research, 15(1), 95-110.

van den Abbeele, A., Roodhooft, F. & Warlop, L. (2009). The Effect of Cost Information on Buyer-Supplier Negotiations in Different Power Settings. Accounting, Organizations and Society, 34(2), 245-266.

van der Meer-Kooistra, J. & Vosselman, E. G. J. (2000). Management Control of Interfirm Transactional Relationships: The Case of Industrial Renovation and Maintenance. Accounting, Organizations and Society, 25(1), 51-77.

van Poucke, D. & Buelens, M. (2002). Predicting the Outcome of a Two-party Price Negotiation: Contribution of Reservation Price, Aspiration Price and Opening Offer. Journal of Economic Psychology, 23(1), 67-76.

Walton, R. E. & McKersie, R. B. (1966). Behavioral Dilemmas in Mixed-motive Decision Making. Behavioral Science, 11(5), 370-384.

Wang, K. J. (2010). Negotiating a Fair Value under Accounting Uncertainty: A Laboratory Experiment. Behavioral Research in Accounting, 22(1), 109-134.

Wilken, R., Cornelißen, M., Backhaus, K. & Schmitz, C. (2010). Steering Sales Reps through Cost Information: An Investigation into the Black Box of Cognitive References and Negotiation Behavior. International Journal of Research in Marketing, 27(1), 69-82.

Appendix

Table C-15: Analyzed companies and their key characteristics

Company label	MF1	MF2	MF3	MF4	MF5	MF6	MF7	MF8
Industry	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing	Manufacturing
Number of employees	10,000-99,999	≤999	≤999	10,000-99,999	1,000-9,999	10,000-99,999	≥100,000	≥100,000
Sales in m euro	1,000-9,999	≤99	100-999	1,000-9,999	1,000-9,999	1,000-9,999	≥10,000	≥10,000
Number of employees in purchasing	100-999	≤9	10-99	100-999	10-99	Not provided	Not provided	≥1,000
Purchasing volume in m euro	≥10,000	≤99	≤99	100-999	100-999	1,000-9,999	≥10,000	≥10,000
Material ratio	66%	58%	57%	25%	47%	60%	69%	66%
Share of capital equipment in purchasing volume	9%	5%	3%	8%	1%	4%	4%	4%
Typical kinds of capital equipment	Conveying equipment (trucks, excavators), crushing plant	Indoor crane	Machine tools	Buildings, forklifts	Welding robot	Machines, facilities	Machines, manufacturing facilities	Cars, containers, reactors

Company label	**SE1**	**SE2**	**SE3**	**SE4**	**SE5**	**SE6**	**CT1**	**CT2**	**CP1**	**CP2**
Industry	Services	Services	Services	Services	Services	Services	Construction	Construction	Consumption	Consumption
Number of employees	10,000-99,999	≤999	10,000-99,999	1,000-9,999	≤999	≥100,000	1,000-9,999	≤999	≥100,000	10,000-99,999
Sales in m euro	1,000-9,999	≤99	1,000-9,999	1,000-9,999	≤99	≥10,000	100-999	≤99	≥10,000	≥10,000
Number of employees in purchasing	100-999	10-99	100-999	100-999	≤9	Not provided	10-99	10-99	≥1,000	≥1,000
Purchasing volume in m euro	1,000-9,999	1,000-9,999	1,000-9,999	≥10,000	≤99	100-999	100-999	1,000-9,999	≥10,000	≥10,000
Material ratio	42%	100%	54%	100%	31%	1%	45%	100%	51%	53%
Share of capital equipment in purchasing volume	17%	28%	12%	66%	50%	80%	11%	100%	7%	7%
Typical kinds of capital equipment	Transmitting mast, software, network infrastructure	Control units, machines	Indoor cranes, machines	Computer, power supply lines	Eye laser device, eye examination device	Shop fittings, forklift, real estate	Asphalt mixing plant, excavator, truck, construction machineries	Parts of power plants, power supply lines	Machines, manufacturing facilities, new factories	Machines, manufacturing facilities

Table C-16: Summary of the interviewees' function in the companies

Label	MF1	MF2	MF3	MF4	MF5	MF6	MF7	MF8	SE1	SE2	SE3	SE4	SE5	SE6	CT1	CT2	CP1	CP2	Total
Chief executive officer (CEO)							1			1			1		1				4
Head of purchasing	1		1		1				1					2		1			7
Head of production (responsible for CEP)		1				1													2
Purchaser	3			1										5					9
Purchasing management (incl. controlling)	2					1		1	2		1	1					1	1	10
Total	6	1	1	1	1	2	1	1	3	1	1	1	1	7	1	1	1	1	32

Table C-17: Negotiation success of the different roles – means and standard deviations

Role	Mean	N	Std. Deviation
Purchaser	.33864812616	38	.124496681553
Supplier	.65013849487	38	.123219850391
Technician	.66325536058	38	.075910086833
Total	.55068066054	114	.186118349301

Table C-18: Negotiation success of the different roles – ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.566	2	1.283	105.606	.000
Within Groups	1.348	111	.012		
Total	3.914	113			

Table C-19: Further determinants of the capital equipment purchasing negotiation success – means and standard deviations

Negotiation success (role)		N	Mean	Std. Deviation	Std. Error Mean
Number of semesters	Above average	54	5.48	2.995	.408
	Below average	58	4.10	2.245	.295
Ambition	Above average	43	3.86	.743	.113
	Below average	47	3.51	.748	.109
Need: power	Above average	43	.37	.489	.075
	Below average	47	.17	.380	.055

Table C-20: Further determinants of the capital equipment purchasing negotiation success – independent samples t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Number of semesters	Equal variances assumed	7.969	.006	2.767	110	.007	1.378	.498	.391	2.365
	Equal variances not assumed			2.739	98.020	.007	1.378	.503	.380	2.376
Ambition	Equal variances assumed	.855	.358	2.224	88	.029	.350	.157	.037	.662
	Equal variances not assumed			2.224	87.403	.029	.350	.157	.037	.662
Need: power	Equal variances assumed	19.035	.000	2.197	88	.031	.202	.092	.019	.384
	Equal variances not assumed			2.173	79.145	.033	.202	.093	.017	.387

Table C-21: Evaluation difference between project 2 and 5 (roles) – means and standard deviations

Role	Mean	N	Std. Deviation
Purchaser	.1303	38	.15533
Supplier	.1579	38	.16004
Technician	.0658	38	.14524
Total	.1180	114	.15715

Table C-22: Evaluation difference between project 2 and 5 (roles) – ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.170	2	.085	3.595	.031
Within Groups	2.621	111	.024		
Total	2.791	113			

Table C-23: Project evaluations – correlations

	User Value			Final price			Negotiation success			Final price / user value		
Role	Person Corre-lation	Sig. (2-tailed)	N	Person Corre-lation	Sig. (2-tailed)	N	Person Corre-lation	Sig. (2-tailed)	N	Person Corre-lation	Sig. (2-tailed)	N
Purchasers	0.329	.000	304	-0.131	.022	304	0.148	.010	304	-0.355	.000	304
Suppliers	0.380	.000	304	0.011	.848	304	0.125	.029	304	-0.345	.000	304
Technicians	0.526	.000	304	0.197	.000	304	0.015	.000	304	-0.526	.000	304
Total	0.410	.000	912	-0.067	0.044	912	0.043	.193	912	0.408	.000	912

Table C-24: Project evaluations – user value correlation comparing

Pair	Role	Fisher's z	z	Sig.
Purchasers - Suppliers	Purchasers	0.34	0.72	.474
	Suppliers	0.40		
Purchasers - Technicians	Purchasers	0.34	2.98	.003
	Technicians	0.58		
Suppliers - Technicians	Suppliers	0.40	2.26	.024
	Technicians	0.58		

D. Author's Curriculum Vitae

Personal Data

Date of birth	02/14/1980
Place of birth	Biberach an der Riß, Germany
Nationality	German

Professional Experience

Since 01/2010	*Chair of Logistics Management, University of St.Gallen, Switzerland* Research Associate, Project Manager of the "Kerkhoff Competence Center of Supply Chain Management"
03/2004 – 10/2007	*Rücker GmbH, Munich (through employee assignment at the BMW Group, Munich), Germany* Project Engineer in the area of vehicle durability testing and functional validation (powertrain development), From 09/2006 served as leader of the powertrain team

Education

01/2010 – 09/2013	*Ph.D. Studies in Business Administration at the University of St.Gallen, Switzerland* Ph.D. Dissertation: "Savings Measurement for Capital Equipment Purchasing: Procedures, Challenges, Contingencies, and Behavioral Aspects"
10/2007 – 12/2009	*Master Program in Business Engineering at the Karlsruhe Institute of Technology, Germany* Master Thesis: "Economic Evaluation of a Europe-Wide Intermodal Transportation Network" Degree: Master of Science in Business Engineering

10/1999 – 02/2004 *Diploma Study in Business Engineering at the Munich University of Applied Sciences, Germany*
Branch of study: Industrial Engineering, Diploma Thesis: "Analysis and Evaluation of a Driverless Transport System for Assembly Line Supply in the Automotive Industry"
Degree: Diplom-Wirtschaftsingenieur (FH)

09/1990 – 06/1999 *Wieland-Gymnasium, Biberach an der Riß, Germany*
Degree: General Qualification for University Entrance

Internships and Diploma Position

04/2003 – 09/2003 *BMW Group, Plant Leipzig, Munich / Leipzig, Germany*
Diploma thesis in logistics planning

04/2002 – 08/2002 *Liebherr-Australia Pty. Ltd., Adelaide, Australia*
Internship in marketing and sales

09/2000 – 02/2001 *Liebherr-Hydraulikbagger GmbH, Kirchdorf an der Iller, Germany*
Internship in production

06/1999 – 08/1999 *Kaltenbach & Voigt GmbH & Co. KG, Biberach an der Riß, Germany*
Pre-study internship in the training workshop