

FABIAN MANFRED EDGAR NULLMEIER

Effective contracting of uncertain performance outcomes

Allocating responsibility for performance outcomes to align goals across supply chain actors



EFFECTIVE CONTRACTING OF UNCERTAIN PERFORMANCE OUTCOMES

**ALLOCATING RESPONSIBILITY FOR PERFORMANCE OUTCOMES
TO ALIGN GOALS ACROSS SUPPLY CHAIN ACTORS**

EFFECTIVE CONTRACTING OF UNCERTAIN PERFORMANCE OUTCOMES

**ALLOCATING RESPONSIBILITY FOR PERFORMANCE OUTCOMES
TO ALIGN GOALS ACROSS SUPPLY CHAIN ACTORS**

Effectief contracteren van onzekere uitkomsten

Toewijzen van verantwoordelijkheid voor uitkomsten
om doelen af te stemmen tussen supply chain partijen

Thesis

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus

Prof. dr. R.C.M.E. Engels

and in accordance with the decision of the Doctorate Board.

The public defence shall be held on
Thursday 13 September 2019 at 11:30 hrs

by

Fabian Manfred Edgar Nullmeier
born in Frankfurt am Main, Germany

Doctoral Committee

Supervisors:

Prof. dr. J. Y. F. Wynstra

Prof. dr. ir. E. M. van Raaij

Other members:

Prof. dr. ir. J.C. M. van den Ende

Prof. dr. M. Spring

Dr. ir. W. van der Valk

Erasmus Research Institute of Management – ERIM

The joint research institute of the Rotterdam School of Management (RSM)
and the Erasmus School of Economics (ESE) at the Erasmus University Rotterdam
Internet: www.erim.eur.nl

ERIM Electronic Series Portal: repub.eur.nl/

ERIM PhD Series in Research in Management, 484

ERIM reference number: EPS-2019-484-LIS

ISBN 978-90-5892-550-3

© 2019, Fabian Manfred Edgar Nullmeier

Design: PanArt, www.panart.nl

This publication (cover and interior) is printed by Tuijtel on recycled paper, BalanceSilk®

The ink used is produced from renewable resources and alcohol free fountain solution.

Certifications for the paper and the printing production process: Recycle, EU Ecolabel, FSC®, ISO14001.

More info: www.tuijtel.com

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the author.



ACKNOWLEDGEMENTS

The completion of my dissertation marks the end of an eleven year journey at Erasmus University. Starting out as a bachelor student in 2008, the past eleven years have contributed greatly to my academic and personal development. There are many individuals that have inspired and helped me during this journey. I am very grateful for every valuable interaction I have had with professors, support staff, fellow doctoral students, classmates, and students whom I got to teach. Since there are too many to name in this section, I will highlight a view of the most influential individuals during my journey as a PhD candidate.

I would like to start by thanking my supervisors Finn Wynstra and Erik van Raaij. During a challenging time in my career, you gave me the opportunity to join your team as a research assistant. This enabled me to see the university from a different perspective. I learned that I really enjoyed teaching our students and thinking critically about challenging business problems. These insights and the joy that came with being part of your team led me to pursuing my PhD. I was honored by the freedom and responsibility you gave me in coordinating an MSc elective and conducting my research projects. Thank you for providing me with these great opportunities, the discussions about my research, and for being open to my criticism and drive to improve different aspects of academia.

One of the biggest joys of pursuing my PhD was being part of the PSM@RSM team that Finn and Erik have created. Anna, Bernice, Erick, Kees, Liubov, Loïse, Melek, Peter, and Robert I am grateful for all the lessons you have taught me and the support you have provided me during this journey. Thank you for the stimulating conversations about research and life in general. Anna, Bernice, Erick, Kees, Liubov, Loïse, Melek, and Robert thank you for your help in inspiring students to pursue a career in purchasing through teaching in the Strategic Sourcing elective. Being part of such a dedicated team of individuals always motivated me to do the best I could. You have become like a family to me.

I would also like to acknowledge the role of my office mates Anirudh, Fouad, and Vikrant during this journey. I have always enjoyed coming to T9-53 because you made our office such an enjoyable place to work. I would like to especially thank Vikrant for the insightful discussions about our research. You have been a great friend and colleague. It would have been far more challenging to complete my dissertation, if you had not provided me with so much help. I would also like to thank all other members of the

Acknowledgements

Technology and Operations Management department that have played an important role in my journey. I am particularly grateful to Carmen, Cheryl, Daan, Henk, Jan, Jan, Jun, Merieke, Michaela, Paul, Rene, Robert, Sandra, Serge, and Yixian for always being willing to answer my questions concerning research and teaching. I would also like to thank the ERIM staff (especially Miho and Kim), which have been very supportive during my time as a PhD candidate.

I would like to thank Kostas, Martin, and Wendy for being my co-authors and source of inspiration. I am really impressed by your drive to conduct great research and have learned a lot from our discussions in Lancaster, Tilburg, at conferences, and on Skype. Bart, Erik, Hans, Kees, Ludger, Martijn thank you for opening your doors to me. Without your help in collecting data for my research projects I would not have been able to write this dissertation.

Most importantly, I would not have been able to complete this journey without the support of my wife and family. Chloe, you represent what is most valuable to me throughout this journey. Meeting you during one of the doctoral courses was the best thing that has happened to me. Since that point in time you have enriched my life, taught me invaluable lessons, and played an important role in me completing this dissertation. You have driven me to look beyond qualitative research, which has resulted in me conducting two research projects that have become part of this dissertation. I am also very grateful for the support of my parents, brother, and grandparents. Your continued support has meant a lot to me during this journey. Mom and dad thank you for being so caring to me, Chloe and our dogs. Niklas, thank for being such a great brother. Granddad, I have finally achieved your dream that your progeny be bestowed the doctoral title. Now that I am moving on to a career beyond academia I hope that I can be half as successful as you, dad and granddad.

TABLE OF CONTENTS

CHAPTER 1	1
1.1 RESEARCH BACKGROUND	1
1.2 THEORETICAL BACKGROUND.....	3
1.3 MOTIVATION AND DISSERTATION OUTLINE.....	8
1.3.1 Empirical study 1: Mitigating shirking when contracting performance outcomes in buyer-initiated service triads.....	8
1.3.2 Empirical study 2: Outcome attributability in performance-based contracting.....	9
1.3.3 Empirical study 3: Uncovering behavioral effects of causal attributions and attributional biases in performance-based contracting	11
1.3.4 Empirical study 4: Servitization: how property rights and obligations tied to selling performance outcomes drive manufacturers to engage in a supply chain realignment process.....	13
1.4 DECLARATION OF CONTRIBUTIONS.....	15
CHAPTER 2	19
2.1 INTRODUCTION.....	19
2.2 LITERATURE REVIEW	23
2.2.1 Outcome Uncertainty and Buyer Satisfaction.....	23
2.2.2 Combined Effects of Performance-based and Behavior-based Contracting.....	27
2.3 METHODOLOGY	33
2.3.1 Measure Development	33
2.3.2 Measures	35
2.3.3 Data Collection Procedure	38
2.3.4 Non-response Bias	41
2.3.5 Construct Measurement Qualities.....	42
2.3.6 Common Method Bias	45
2.4 ANALYSIS AND RESULTS.....	46
2.4.1 Direct Effect Analysis.....	46
2.4.2 Mediation Analysis.....	47
2.4.3 Moderation Analysis.....	48
2.5 DISCUSSION AND CONCLUSION.....	54
2.5.1 Theoretical Contributions	54

Table of contents

2.5.2	Managerial Contributions	57
2.5.3	Limitations and Future Research	58
CHAPTER 3		61
3.1	INTRODUCTION	61
3.2	LITERATURE REVIEW	64
3.2.1	Uncertainty and Attributability of Performance Outcomes	64
3.2.2	Roles of the Customer	66
3.2.3	Contract Management Activities	68
3.2.4	Effects on Performance	70
3.3	METHODS	71
3.3.1	Sampling and Data Collection	72
3.3.2	Data Analysis	74
3.4	CASE DESCRIPTION AND ANALYSES	74
3.4.1	Context Case 1: National Train Operator	74
3.4.2	Analysis Case 1: National Train Operator	76
3.4.3	Context Case 2: University Hospital	81
3.4.4	Analysis Case 2: University Hospital	82
3.5	DISCUSSION	88
3.5.1	External Factors	88
3.5.2	Supply Chain Roles and Outcome Attributability	89
3.5.3	Contract Management Activities	93
3.5.4	Conceptual Model	96
3.6	CONCLUSIONS	98
3.6.1	Theoretical Contributions	98
3.6.2	Managerial Contributions	99
3.6.3	Limitations and Future Research	100
CHAPTER 4		103
4.1	INTRODUCTION	103
4.2	LITERATURE REVIEW	106
4.2.1	Psychological Effects of Performance-based Contracts	106
4.2.2	Attribution Theory	107
4.2.3	Attributional Biases	109
4.3	EXPLORATORY CASE STUDY	111
4.3.1	Case Description	111
4.3.2	Data Collection and Analysis	112

Table of contents

4.3.3	Case Analysis and Results	113
4.3.4	Preliminary Findings.....	117
4.4	HYPOTHESIS DEVELOPMENT	118
4.4.1	Emotions	118
4.4.2	Attributional Biases	120
4.5	SCENARIO-BASED EXPERIMENT	122
4.5.1	Experimental Design and Participants	122
4.5.2	Measures	126
4.6	ANALYSIS AND RESULTS.....	128
4.6.1	Manipulation Checks	128
4.6.2	Hypothesis Testing	128
4.6.3	Post-hoc Analysis	130
4.7	DISCUSSION.....	133
4.7.1	Theoretical Contributions	133
4.7.2	Managerial Contributions	135
4.7.3	Limitations and Future Research	135
CHAPTER 5		139
5.1	INTRODUCTION	139
5.2	LITERATURE REVIEW	142
5.2.1	Servitization of Manufacturing and Service-based business models 142	
5.2.2	A Property Rights Perspective on Servitization.....	144
5.2.3	Servitization and Supply Chain Alignment	147
5.3	METHODOLOGY	149
5.3.1	Data collection	150
5.3.2	Analytic method.....	152
5.4	FINDINGS	154
5.4.1	Case Description	154
5.4.2	Customer Alignment – Redistributing Rights and Obligations between Customer and Manufacturer.....	159
5.4.3	Internal Alignment – Assigning Responsibility for Obligations to Business Functions.....	162
5.4.4	Supplier Alignment – Transferring Responsibility for Obligations to the Supply Base.....	165
5.4.5	Episode Sequences.....	169
5.5	DISCUSSION.....	173

Table of contents

5.6 CONCLUSION	178
5.6.1 Theoretical Contributions	178
5.6.2 Managerial Contributions	181
5.6.3 Limitations and Future Research Directions.....	182
CHAPTER 6.....	186
6.1 DISCUSSION AND CONCLUSION.....	186
6.2 MANAGERIAL CONTRIBUTIONS	191
6.3 LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH.....	195
REFERENCES.....	198
APPENDICES.....	226
APPENDIX A. MEASUREMENT OF CONSTRUCTS	226
APPENDIX B. CODING SCHEME.....	231
APPENDIX C. VALIDATION OF CASE STUDY RESULTS	232
APPENDIX D. CASE CONTEXT COMPARISON	233
APPENDIX E. OVERVIEW OF EPISODIC SEQUENCES	234
APPENDIX F. OVERVIEW OF EPISODIC SEQUENCES	235
SUMMARY	236
SAMENVATTING	240
ABOUT THE AUTHOR	244
PORTFOLIO.....	246

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

According to extant literature, organizations are faced with a choice between two main types of contractual mechanisms when buying goods and services: behavior-based contracting (BBC) or performance-based contracting (PBC) (Eisenhardt, 1989a). BBC is seen as a more classic approach to contracting in which buying organizations (hereafter referred to as buyers) specify the behavior (i.e., processes and inputs to be used) that suppliers should engage in (Sumo et al., 2016). BBC provides buyers with a lot of control over the actions of their suppliers. However, BBC provides no incentives for suppliers to engage in product, service or process innovation as they are to stick to the behavioral requirements specified by buyers. It is therefore that BBC generally does not result in innovative solutions but rather drives suppliers to deliver status quo products or services. On the other hand, PBC is seen as a more modern approach to contracting as it focusses on performance outcomes (e.g., efficiency, quality and uptime) to be delivered by suppliers (Selviaridis and Wynstra, 2015). To motivate suppliers to deliver superior products or services, PBC ties (a part of) suppliers' pay to the achievement of performance outcomes (Jensen and Meckling, 1976; Ouchi, 1979). It is through this contractual mechanism that PBC can significantly improve supplier performance (Guajardo et al., 2012; Sihag and Rijdsdijk, 2018).

These positive performance implications of PBC have resulted in considerable attention in practice. PBC has, amongst others, been widely applied in the construction sector, defence sector, infrastructure sector, and

healthcare sector (Adida and Bravo, 2018; Francart et al., 2019; Settanni et al., 2017; Sumo et al, 2016). However, empirical evidence reveals that buyers and suppliers have faced considerable challenges in realizing the promise of innovative solutions and improved supplier performance (e.g., Banker, Lee, Potter & Srinivasan, 1996; Ng & Nudurupati, 2010; Ssengooba, McPake & Palmer, 2012). Determinants of PBC effectiveness have therefore received renewed attention from academics (e.g., Glas, Raithel, and Essig, 2019; Kreye, 2018, 2019; Steinbach, Wallenburg & Selviaridis, 2018).

A recent meta-analysis reveals that PBC effectiveness is task dependent (Sihag and Rijdsdijk, 2018). In her seminal work Eisenhardt (1989a) proposed that the task characteristics listed in Table 1.1 determine whether BBC or PBC is most effective when contracting services.

Table 1.1

Proposed task characteristics that determine effectiveness of BBC and PBC

	BBC	PBC
Risk aversion agent	+	-
Risk aversion principal	-	+
Goal conflict	-	+
Duration of relationship	+	-
Task programmability	+	-
Information systems	+	-
Outcome measurability	-	+
Outcome uncertainty	+	-

Of these task characteristics, outcome uncertainty – the extent to which variations in performance outcomes are not under the control of suppliers – has become a central topic of study in contracting literature (Steinbach, Wallenburg, and Selviaridis, 2018; Selviaridis and Norrman,

2014). The financial risk introduced by high levels of outcome uncertainty is said to drive suppliers to engage in opportunistic actions that are not in the interest of buyers. Thus, using PBC in contexts characterized by outcome uncertainty has been said to be counterproductive. However, anecdotal evidence suggested that PBC can be effective in motivating suppliers to deliver superior performance, even when they are exposed to financial risk due to outcome uncertainty.

The insight that, in contrast to what literature would predict, PBC could be used successfully to contract and sell services characterized by outcome uncertainty is what inspired this dissertation. To develop knowledge about the PBC practices that organizations can engage in to successfully purchase and sell services characterized by outcome uncertainty, four empirical studies have been conducted. The next sections describe the theoretical frameworks that the four studies are grounded in and discuss the motivation behind each of the four studies.

1.2 THEORETICAL BACKGROUND

In extant PBC literature, agency theory (Jensen and Meckling, 1976) and the seminal work by Ouchi (1979) on organizational control are some of the most widely used theoretical frameworks (Selviaridis and Wynstra, 2015). Following this tradition, the first (Chapter 2) and second empirical study (Chapter 3) are grounded in agency theory and theories on organizational control. Both frameworks emphasize the choice that buyers need to make between PBC and BBC. Agency theory concerns itself with agency problems that result from conflicts of interest between the buyer and the supplier hired to complete a task (Jensen and Meckling, 1976). Agency problems arise as both buyers and suppliers are assumed to be rational utility maximizers that

are risk averse and motivated by self-interest (i.e. willing to increase their own wealth with minimal effort) (Eisenhardt, 1989a). Suppliers are therefore said to engage in behavior motivated by self-interest that is not beneficial to the buyer, if the goals of these two parties are not aligned (Fama and Jensen, 1983).

Therefore, contracting scholars have studied how incentives can act as devices to align the buyer's and supplier's goals (Fayezi, O'Loughlin, and Zutshi, 2012). Alignment of incentives is pertinent to exchanges as two types of agency problems exist (Jensen and Meckling, 1976). The first is a pre-contractual problem referred to as 'adverse selection', which arises due to hidden information (Bergen, Dutta, and Walker Jr, 1992). As the supplier has superior information to the buyer, it can engage in opportunistic actions by misrepresenting its actual ability to be awarded a contract or achieve advantageous terms. The second is a post-contractual problem referred to as 'moral hazard'. This arises when the supplier engages in hidden opportunistic actions that are not in line with the buyer's goals. It is also known as 'shirking' as the supplier pursues its self-interest by shirking on costly efforts (Ross, 1973). It is said that buyers can mitigate adverse selection by engaging in information gathering to improve supplier selection (Bergen et al., 1992). Buyers can mitigate the second agency problem, moral hazard, by designing appropriate contracts (Jensen and Meckling, 1976). Previous studies find that through the implementation of PBC, buyer and supplier goals can be aligned (Datta and Roy, 2011; Jain, Hasija, and Popescu, 2013). Goal alignment is achieved by tying the supplier's pay to the achievement of buyer-specified outcomes.

Theories on organizational control build on these insights by putting forth contracts as coordination devices (Macaulay, 1963). That is, buyers enforce control by implementing contractual controls to direct attention, motivate, and encourage suppliers to act in ways that are in line with the buyer's goals (Long, Burton, and Cardinal, 2002; Tiwana and Keil, 2010). What makes this theoretical framework of specific importance to this dissertation, is the added focus on how buyers enact control by putting in place an evaluation process through which outcomes and behavior are monitored and evaluated (Ouchi, 1977). Therefore, these two theoretical frameworks are complementary. While agency theory provides insights into the factors that should be taken into account when designing contracts, theories on organizational control provide insights concerning the type of control mechanism that should be used to exercise control during the contract management phase.

While these theoretical frameworks have provided critical insights for contracting research, the behavioral assumptions that they are based on have had to endure criticism (Bendoly, Donohue, and Schultz, 2006; Katsikopoulos and Gigerenzer, 2013). The primary criticism concerns the assumption that individuals are rational utility optimizers who are unfazed by emotions and cognitive biases. To gain a better understanding of the role that emotions and cognitive biases play in relation to PBC, Chapter 4 is grounded in attribution theory (Weiner, 1985). Attribution theory provides insights into how perceived causes of outcomes affect an individual's behavior. Attribution theory originates in the insight that the fundamental cognitive processes through which people deal with uncertainty result in attributions, which individuals use to become more effective in dealing with

their environment (Heider, 1958). Based on this notion Weiner (1985, 1986) further developed attribution theory by focusing on how causal dimensions of attributional explanations affect emotions and behaviors of individuals. Understanding attributional explanations is crucial as individuals are thought to shape their future behavior to events according to a subjective understanding of what caused these events. That is, when a supplier is confronted with a failure in achieving a performance outcome specified by the buyer, causal attributions concerning the cause of failure will determine the supplier's future behavior.

To comprehend how 'attributional explanations' lead to psychological and behavioral consequences, Weiner (1985, 1986) suggests three basic properties based on which all causes of outcomes can be characterized: locus, controllability, and stability. Locus refers to the location of a cause (internal or external to the individual), controllability refers to the degree to which the cause is subject to volitional change (controllable versus uncontrollable by the individual), and stability pertains to the relative endurance of a cause over time (stable versus unstable). A classic example of a cause of success is 'effort', which is often considered to be 'internal' to the individual, 'controllable' by the individual, and 'unstable'. On the other hand, 'bad luck' as a cause of failure is often considered to be 'external' to the individual, 'uncontrollable' by the individual and 'unstable'. The causal placement on these three basic properties is said to result in a specific emotion that is experienced by individuals. While some causes trigger positive emotions that have positive behavioral consequences, others trigger negative emotions that have negative behavioral consequences. It is therefore, that attribution theory acts as a useful theoretical lens for Chapter

4 to determine behavioral consequences of outcome uncertainty inducing factors.

The final empirical Chapter is grounded in property rights theory (Coase, 1960). Property rights theory acknowledges that contracts are by definition incomplete (Kim and Mahoney, 2002). That is, not every contingency can be captured in a contract *ex ante*. Building on this insight, property rights theory introduces ownership concepts in incomplete contract settings. More specifically, property rights theory argues that transactions between organizations revolve around exchanging ownership of property rights rather than products (Coase, 1960). Property rights here refer to the rights “to the use of resources ... supported by the force of etiquette, social custom, ostracism, and formal legally enacted laws supported by the states’ power of violence or punishment” (Alchian, 1965, p. 817). By focusing on how organizations exchange ownership of property rights, this theoretical perspective differentiates itself from agency theory (Jensen and Meckling, 1976) since it adopts a dynamic view on how economic inefficiencies can be addressed (Kim and Mahoney, 2005). That is, it studies how economic inefficiencies due to opportunism, bounded rationality, and information asymmetry can be minimized by allocating risks and rewards tied to property rights in an effective manner among organizations. Therefore, it provides detailed theoretical insights for Chapter 5 concerning the realignment objectives, incentives and activities in response to reallocations of property rights and obligations tied to selling performance outcomes.

1.3 MOTIVATION AND DISSERTATION OUTLINE

1.3.1 Empirical study 1: Mitigating shirking when contracting performance outcomes in buyer-initiated service triads

The first empirical study focuses on contract design and contract management practices that can be used to mitigate shirking behavior by suppliers. Existing contracting literature has predominantly focused on explaining functions of contractual mechanisms to develop knowledge about effective contract design (Selviaridis and Wynstra, 2015). Yet, the actual execution of contracts during the contract management phase, has received little attention from scholars. Under the assumption that contract management activities are strictly in line with what has been specified in contracts, investigating the contracting phases separately would be futile. However, this assumption has been questioned since contracts being incomplete requires buyers to address unforeseen situations during the contract management phase. This makes contract management activities of particular importance in contexts characterized by outcome uncertainty. Therefore, we posit that *contracting* is to be conceptualized as contract design and contract management. This reconceptualization raises the following question:

RQ1. In which manner should buyers combine PBC and BBC during the contract design and contract management phases to mitigate supplier shirking when contracting services characterized by outcome uncertainty?

This first empirical study aims to answer the formulated research question, by conducting a theory testing study. By adopting survey as a research strategy, data from a sample of organizations has been collected in a structured way such that several hypotheses could be tested (Groves et al., 2009). Survey was selected as the appropriate research strategy since knowledge about combining contractual controls was reasonably well developed, the variables could be clearly defined, and since the purpose of this study was to test relationships between variables (Forza, 2009).

1.3.2 Empirical study 2: Outcome attributability in performance-based contracting

Based on the findings of the first study, it becomes apparent that the use of contractual controls during the contract management phase can reduce negative performance effects of outcome uncertainty. However, Study 1 paid little attention to the manner in which outcome uncertainty comes about in buyer-supplier relationships. And more importantly, which actions can be taken by buyers to reduce outcome uncertainty. Based on previous studies we lack an understanding of the manner in which actions of buyers affect outcome uncertainty during the contract management phase. Eisenhardt (1989a) had proposed that outcome uncertainty arises due to the presence of environmental factors such as the economic climate and regulatory environment. By focusing on factors residing outside the buyer-supplier relationship, contracting literature had paid little attention to factors tied to the interaction between buyers and suppliers. These interactions are of particular relevance in services contracting, since buyers fulfill specific roles through which they provide suppliers with inputs essential to the service production process (Sampson and Froehle, 2006). It has, however, been

unclear how buyers fulfilling these roles impact outcome uncertainty. This insight raises the following question:

RQ2. How does the outcome uncertainty of a service provision process relate to the roles of the buying organization in service design and production?

When suppliers to a large extent depend on buyer inputs, variations in the quality and (timely) availability of buyer inputs may considerably increase outcome uncertainty. Previous studies predict that this in turn would drive suppliers to engage in opportunistic actions. The first empirical study finds that contract management activities can mitigate this effect. However, it was unclear how buyers engaging in contract management activities can increase the effectiveness of PBC. This insight raises the following question:

RQ3. How and to what extent do specific contract management activities enhance the effectiveness of PBC?

This second empirical study aims to elaborate on the findings of Study 1 and existing theory by conducting a multiple case study of organizations contracting uncertain performance outcomes. Theory elaboration does not seek to generate new theory or test existing theory but can be used to introduce new concept(s), examine boundary conditions, or investigate relationships between concepts (Ketokivi and Choi, 2014). Case study was selected as a research strategy since few empirical studies had been conducted about the phenomenon captured in

our research questions (Yin, 1994; Voss, Tsikriktsis, and Frohlich, 2002; Voss, 2009). The case study methodology enabled us to investigate this phenomenon in a more detailed manner than was possible in Study 1 based on contextually rich data from a bounded real-world setting (Barratt, Choi, and Lee, 2011). More specifically, it enabled us to answer ‘how’ investigated concepts are related to each other through inductive reasoning (Yin, 1994; Voss et al., 2002; Voss, 2009).

1.3.3 Empirical study 3: Uncovering behavioral effects of causal attributions and attributional biases in performance-based contracting

The findings of Study 2 provide us with initial evidence that environmental factors and buyer actions each have negative performance effects, since they contribute to the rise of outcome uncertainty. However, due to limitations of the (non-longitudinal) case study methodology, causal relationships between these concepts could not be tested. Therefore, it remains unclear whether both causes of outcome uncertainty affect supplier behavior negatively. Adhering to theories originating in the field of economics (Jensen and Meckling, 1976), as contracting literature generally does (Selviaridis and Wynstra, 2015), would lead one to conclude that any factor that causes outcome uncertainty to arise, negatively influences supplier behavior. As has been discussed in the previous section, these conclusions are based on the assumption that managers are rational decision makers who are unaffected by emotions and cognitive biases (Bendoly et al., 2006; Katsikopoulos and Gigerenzer, 2013). Given that previous studies on the use of PBC have generally been conducted at the organization level, we lack an understanding of the behavioral effects of PBC at the individual level. More specifically, it

is unclear whether the prediction that managers respond rationally to outcome uncertainty inducing factors is representative of empirical reality. This insight raises the following question:

RQ4. How do emotions triggered by environmental factors and buyer actions affect supplier behavior when uncertain performance outcomes are contracted?

Behavioral operations management literature has also proposed that cognitive biases can cause individuals to respond differently to certain factors (Bendoly et al., 2006; Katsikopoulos and Gigerenzer, 2013). If individual managers were to respond differently to environmental factors and/or buyer actions, determining whether PBC is effective in contracting performance from a specific supplier could be far more complex than initially thought. That is, purchasing managers would have to take into account cognitive biases of key decision makers at suppliers to determine whether PBC is suitable to contract performance from a specific supplier. This raises the following question:

RQ5. How do cognitive biases of supplier managers affect the ability of PBC to govern supplier behavior?

The third empirical study combines an exploratory case study strategy of an organization contracting uncertain performance outcomes (Akkermans and Vos, 2003) with a scenario-based experiment with practitioners (Rungtananatham, Wallin, and Eckerdt, 2011). The exploratory

case study methodology was used to further explore relationships between concepts of interest in an empirical setting. Based on the insights gained from Study 2 and by conducting the exploratory case study, testable hypotheses were developed. These hypotheses were then tested by conducting a scenario-based role-playing experiment. “A scenario-based role-playing experiment ... is an experiment in which varying versions of a descriptive vignette are deployed to convey scripted information about specific levels of factors of interest (i.e., independent variables) to human subjects” (Rungtusanatham et al., 2011, p. 9). By comparing the behavioral consequences of the factors captured in the vignettes, the formulated hypotheses were tested. In contrast to the case study methodology used in Study 2, this experimental methodology used in Study 3 enabled us to test causal relationships causes of outcome uncertainty and supplier behavior.

1.3.4 Empirical study 4: Servitization: how property rights and obligations tied to selling performance outcomes drive manufacturers to engage in a supply chain realignment process

The first three studies provide us with insights concerning contracting practices that buyers can engage in to mitigate negative performance effects of outcome uncertainty. What has received little attention, is the operational changes that suppliers need to undertake to be effective in selling performance outcomes. Servitization literature has studied transitions from product to services selling extensively. However, previous studies have paid little attention to property rights and obligations associated with selling equipment performance. Property rights theory helps explain how the partitioning of property rights and the distribution of income generated by a bundle of rights influence incentive alignment (or lack thereof) between

supply chain counterparts (Coase, 1960). While this theoretical framework has hardly been applied in operations literature (Walker et al., 2015), it provides important insights concerning incentives at play in a supply chain context. The acquisition of property rights by suppliers allows them to extract additional financial value from selling equipment performance. At the same time, the obligations associated with the acquisition of property rights exposes suppliers to considerable financial uncertainty. However, it remains unclear how resulting financial rewards and risks affect the alignment of objectives, incentives and operational activities across supply chain actors. Based on this insight the following question arises:

RQ6. How do reallocations of property rights and obligations, tied to selling performance outcomes, drive manufacturers to realign objectives, incentives and operational activities across multiple supply chain tiers?

This fourth empirical study aims to elaborate on the variance theory based insights from the first three studies and existing literature by developing process theory (Ketokivi and Choi, 2014; Langley, 1999). “Whereas variance theories provide explanations for phenomena in terms of relationships among dependent and independent variables (e.g., more of X and more of Y produce more of Z), process theories provide explanations in terms of the sequence of events leading to an outcome (e.g., do A and then B to get C)” (Langley, 1999, p. 691). Process research thereby enabled us to generate knowledge about how specific changes can be produced (Langley et al., 2013). A longitudinal Process theory complements single case study

about an organization transitioning towards selling performance outcomes has been conducted to answer the formulated research question (Barratt et al., 2011; Barratt and Barratt, 2011; Soundararajan and Brammer, 2018; Stuart et al., 2002). The longitudinal case study methodology was selected as it is well suited to study the process-based phenomenon captured in the research question.

1.4 DECLARATION OF CONTRIBUTIONS

I hereby declare my contribution to the different chapters of this dissertation and also acknowledge the contributions of other contributors where relevant.

Chapter 1: This chapter has been written independently by the author of this dissertation. The feedback from the promoters Finn Wynstra and Erik van Raaij has been incorporated.

Chapter 2: The majority of the work presented in this chapter has been done independently by the author of this dissertation. The author formulated the research question, performed the literature review, participated in the data collection process, conducted the data analysis, and interpreted the findings. The questionnaire which was used to collect the data used in this chapter was designed without the involvement of the author of this dissertation. Data was collected by a team of researchers, which included promotor Finn Wynstra and co-author Wendy van der Valk, and student assistants. Promotor Finn Wynstra and co-author Wendy van der Valk have provided feedback on the chapter and have revised sections of this chapter during a journal review process. The author of this dissertation is the first author of this chapter, and Finn Wynstra and Wendy van der Valk are the co-authors.

Chapter 3: The majority of the work presented in this chapter has been done independently by the author of this dissertation. The author formulated the research question, performed the literature review, collected the data, conducted the data analysis, and interpreted the findings. Promoters Finn Wynstra and Erik van Raaij have provided feedback on the chapter and have revised sections of this chapter during a journal review process. This chapter has been published in a special issue of *Industrial Marketing Management* on performance-based contracting¹. The author of this dissertation is the first author of this chapter, and Finn Wynstra and Erik van Raaij are the co-authors.

Chapter 4: The majority of the work presented in this chapter has been done independently by the author of this dissertation. The author played a leading role in formulating the research question, performing the literature review, collecting data, conducting the data analysis, and interpreting the findings. Co-author Chloe Yang played an important role in the conception, design and execution of this chapter. Based on her expertise in experimental research, the scenario-based experiment was designed and conducted. Feedback received from lecturer Maarten Wubben on early designs of the experiment, provided the foundation for the design of scenario used in this study. Promotor Finn Wynstra provided feedback on the chapter during the course of the project and financed the data collection efforts. The author of this dissertation is the first author of this chapter, and Chloe Yang is the co-author.

¹ Nullmeier, F. M. E., Wynstra, F., & van Raaij, E. M. (2016). Outcome attributability in performance-based contracting: Roles and activities of the buying organization. *Industrial Marketing Management*, 59, 25-36.

Chapter 5: The majority of the work presented in this chapter has been done independently by the author of this dissertation. The author played a leading role in formulating the research question, performing the literature review, collecting data, conducting the data analysis, and interpreting the findings. During the first year of data collection, data were collected by a thesis student supervised by the author of this dissertation. In subsequent years, data were collected by the author of this dissertation. Co-authors Martin Spring and Kostas Selviaridis played an important role in the writing of this paper. They provided extensive feedback on this chapter and revised the introduction and literature review sections. Promotor Erik van Raaij provided feedback on this chapter and revised the methodology section. The author of this dissertation is the first author of this chapter, and Kostas Selviaridis, Martin Spring and Erik van Raaij are the co-authors.

Chapter 6: This chapter has been written independently by the author of this dissertation. The feedback from promotor Finn Wynstra and Erik van Raaij has been incorporated.

CHAPTER 2

Mitigating Shirking when Contracting Performance Outcomes in Buyer-initiated Service Triads²

2.1 INTRODUCTION

With an average annual growth of twenty percent, the global market value of outsourced services will soon surpass that of physical products (Information Services Group, 2018). While outsourcing of services has generally strengthened the customer value propositions of organizations (Maglio and Spohrer, 2008), it has presented organizations with challenges in terms of how to manage outsourcing relationships (Modi et al., 2015). These challenges are particularly apparent in the context of *buyer-initiated service triads* (hereafter service triads), in which a buyer contracts a supplier to supply services directly to a third party, the buyer's customer (Kowalkowski, Kindström, and Carlborg, 2016; Tate and Van der Valk, 2008). This differentiates service triads from more linear manufacturing supply chains, since in these triads each individual party in the supply chain has, at least initially, a direct connection with the other two parties (Li and Choi, 2009; Wynstra et al., 2015). An illustration of this would be an internet service provider (ISP) that contracts a maintenance service provider to handle technical issues faced by the ISP's customers. Here the primary service interaction is between the maintenance service provider and the ISP's

² This chapter is a reworked version of a manuscript that has been submitted to the Journal of Purchasing and Supply Management.

customers, even though the customers have a contractual relationship with the ISP. This means that suppliers in triadic structures, in general, have ample opportunity to shirk their responsibility without being detected due to the inherent information asymmetry between buyers and suppliers (Hartmann and Herb, 2014; Li and Choi, 2009; Zhang, Lawrence, and Anderson, 2015). At the same time, customers will typically blame shortfalls in performance on the organization that is providing that particular product and value proposition (Modi et al., 2015; Nenonen, Ahvenniemi, and Martinsuo, 2014; Sengupta, Niranjana, and Krishnamoorthy, 2018). That is, the ISP's customer will blame the ISP, rather than the contracted maintenance service provider, if technical difficulties are not appropriately dealt with.

To manage these challenges, buyers have relied on performance-based contracting (PBC) to align the goals of suppliers with their own goals and goals of their customers (Eisenhardt, 1989a; Selviaridis and Wynstra, 2015). PBC is a contracting approach that relies on tying at least part of a supplier's payment to its performance, thereby emphasizing outputs or outcomes rather than required inputs, activities or processes (Martin, 2007). While existing studies reveal that PBC is generally effective in improving supplier performance (Sihag and Rijdsdijk, 2018; Sumo et al., 2016; Tiwana and Keil, 2007), PBC has been suggested to be less effective in incentivizing suppliers to deliver performance outcomes that are satisfactory to buyers in contexts in which suppliers are not fully in control of these performance outcomes (Nullmeier, Wynstra, and Van Raaij, 2016; Selviaridis and Norrman, 2014). This is often the case in service triads since (the behaviors of) the buyer and its customers introduce *outcome uncertainty* (Sengupta et al., 2018). Consequently, traditional theories on contracting such as agency

theory (Eisenhardt, 1989a) and theories on organizational control (Ouchi, 1979) suggest that PBC will not be feasible or effective in service triads, and that in such situations behavior-based contracting will be more effective in achieving satisfactory performance outcomes. Behavior-based contracting (BBC) emphasizes rules and procedures that suppliers (agents, controlees) should follow in completing assigned tasks, and supplier performance is evaluated on adherence to these prescriptions (Ouchi and Maguire, 1975; Sihag and Rijdsdijk, 2018). Insights on the relative effectiveness of PBC and BBC are based on the long-standing assumption that these contracting approaches are mutual substitutes. This assumption, however, has been criticized as *artificial* as it is not representative of empirical reality (Sitkin et al., 2010). Contemporary studies have therefore started to consider PBC and BBC as complements rather than substitutes (Nielsen, Kristensen, and Grasso, 2018; Sihag and Rijdsdijk, 2018). This shift has enabled scholars to reach a better understanding of how organizations share different types of risks when operating in complicated settings (De Jong, Bijlsma-Frankema and, Cardinal, 2014). What still has received little attention is the complementarity of PBC and BBC during the different phases of the contracting process. Specifically, it remains unclear precisely what the effects are of combined contractual controls during the contract design phase versus the contract management (execution) phase. A recent exploratory study by Sumo et al. (2016) is one of the first to make an explicit distinction between contract design and contract execution in hypothesizing the effects of PBC, but further empirical validation is needed.

We make three main contributions to the contracting and service triads literature to further our understanding of the complementarity of PBC

and BBC in uncertain contexts such as service triads. First, as a baseline, this study investigates Eisenhardt's (1989a) proposition that *outcome uncertainty* has a negative effect on PBC's ability to achieve the desired performance outcome. While this proposed relationship has informed contracting research and its application in practice over the past decades, this relationship has not, to the best of our knowledge, been tested empirically. More specifically, this study increases our understanding of the behavioral mechanism by which outcome uncertainty makes PBC less effective in achieving performance outcomes. That is, we test whether outcome uncertainty leads suppliers to *shirk their responsibilities* and whether this in turn leads to unsatisfactory supplier performance. Secondly, and most importantly, this study identifies which *combinations* of performance- and behavior-based contractual control mechanisms are effective in decreasing shirking behavior by suppliers in response to outcome uncertainty that arises in service triads. Third, we investigate these combinations and their effects during respectively the contract design phase and the contract management phase.

In the following section, we first summarize current research on PBC and service triads and outline how notions from agency theory can be used to hypothesize on the effective use of PBC in settings where there is a high level of outcome uncertainty. We then introduce our research design and methodology before discussing the findings from our survey data on Dutch buyer–supplier–customer service triads. Finally, we highlight the implications for theory and practice, and discuss limitations and directions for future research.

2.2 LITERATURE REVIEW

Recently, there has been increasing interest in PBC both in practice and in the academic literature (Essig et al., 2016; Guajardo et al., 2012; Sumo et al., 2016). PBC involves tying at least part of a supplier's payment to its performance, thereby emphasizing outputs or outcomes rather than required inputs, activities or processes (Martin, 2007). Little or no research has been done on PBC in triadic relationships (Wynstra et al., 2015). Given the growth in the range of services that suppliers deliver directly to the buyer's customers, buyer-initiated service triads have become an increasingly prevalent phenomenon in both the private and the public sector (Sengupta et al., 2018). The emphasis on performance outcomes makes PBC particularly challenging to implement in service triads, as particularly in these settings, performance outcomes are not always (fully) under the supplier's control (Nullmeier et al., 2016; Selviaridis and Norrman, 2014).

2.2.1 Outcome Uncertainty and Buyer Satisfaction

Studies of contractual arrangements and control mechanisms in buyer-initiated service triads usually draw on Agency Theory, which focuses on governance issues that arise from conflicts of interest between the principal and the agent hired by the principal to complete a task. Agency Theory treats contracts as a mechanism to align interests and incentives and to achieve risk sharing between the parties involved, particularly in situations of information asymmetry (Eisenhardt, 1989a; Jensen and Meckling, 1976). Agency Theory is also commonly used to study the choice between contracting on effort or behavior (behavior-based contracting, BBC) or contracting on output or outcomes (performance-based contracting, PBC) (Selviaridis and Wynstra,

2015). Buyer-initiated service triads involve a high level of information asymmetry between buyer, supplier and customer, all of whom have (partly) different goals (Sengupta et al., 2018; Zhang et al., 2015).

To address such conflicts of interest, agency theorists have investigated the situational characteristics that determine the optimal form of contract and control – performance-based or behavior-based – and have thus focused on the type of incentives to include in contracts in order to minimize adverse behavior by suppliers (Fayezi et al., 2012). Eisenhardt (1989a) suggested that PBC is more effective when performance outcomes are easy to measure, when the parties involved have very different goals, and when the buyer is risk-averse. BBC, on the other hand, is said to be more effective when there is high task programmability, high outcome uncertainty, high information availability, supplier risk-aversion, and a long-term relationship (Ouchi, 1979; Kirsch, 1996). Of these factors, *outcome uncertainty* has gained particular interest in recent research on PBC (Selviaridis and Wynstra, 2015).

Outcome uncertainty arises when performance outcomes are only partly a function of the agent's behavior (Eisenhardt, 1989a; Zu and Kaynak, 2012). Early agency theory literature proposes that environmental factors such as economic climate, government policies and competitor actions – all factors that are external to the principal and agent – are key causes of variations in performance outcomes (Celly and Frazier, 1996; Eisenhardt, 1989a). Moreover, in service outsourcing relationships, suppliers have to rely on customer inputs, including physical assets, information and actors (Chase, 1978; Sampson and Froehle, 2006). These inputs form one of the key factors affecting how much outcome uncertainty a service supplier is exposed to.

Since suppliers that operate in service triads rely on buyer *and* end-customer inputs to the service delivery process (Wynstra et al., 2015), outcome uncertainty typically is quite high (Li and Choi, 2009; Niranjan and Metri, 2008; Nullmeier et al., 2016). According to theory, the higher the outcome uncertainty that suppliers are facing, the less effective is PBC in achieving satisfactory performance outcomes (Gruneberg, Hughes, and Ancell, 2007). Moreover, Stouthuysen, Slabbinck, and Roodhooft (2012) found evidence that output controls – once implemented – have a negative effect on (perceived) supplier performance when services require intensive supplier-customer interaction. In sum, when the actions of the buyer or final customer strongly influence the extent of the liability of the supplier for performance outcomes, contracting on performance is less effective in achieving satisfactory performance outcomes (Handley and Gray, 2013; Mayer, Nickerson, and Owan, 2004). Therefore, we posit that, in the presence of PBC, outcome uncertainty decreases the likelihood of achieving satisfactory performance outcomes. Thus, we formulate the following baseline hypothesis:

Hypothesis 1. In service triads where the buyer-supplier relation is governed by a performance-based contract, outcome uncertainty is negatively associated with buyer satisfaction.

In addition to this baseline hypothesis, we aim to investigate the process by which this effect comes about. According to Agency Theory, the presence of outcome uncertainty, in the context of PBC, is likely to induce

the supplier to act opportunistically by *shirking* (Ross, 1973; Wang and Yang, 2013). While acting opportunistically can refer to any type of adverse action characterized by self-interest with guile, shirking of responsibility is a specific type of opportunistic action (Fong and Tosi, 2007). Shirking – passive, but intentional opportunistic behavior – represents the extent to which a service provider is prone to underperform or withhold resources (Handley and Benton, 2012; Wathne and Heide, 2000). As Handley and Benton (2012, p. 55) argue: “[...] providers may be inclined to withhold resources or “under-invest” in the relationship if they believe the outsourcing firm is unable to detect such action (i.e. shirking).” Outcome uncertainty implies that the service performance achieved cannot be clearly attributed to the supplier; it can also be due to external circumstances, and to the behaviors and inputs of the buyer and customer. Therefore, the supplier may choose to underdeliver, since under PBC its efforts or behavior are not monitored. When suppliers shirk responsibility, they will likely fail to achieve what was agreed upon in the contract and buyers become unsatisfied with the services provided. Based on these insights, we formulate the following mediation hypothesis:

Hypothesis 2. In service triads where the buyer-supplier relation is governed by a performance-based contract, shirking of responsibility by suppliers mediates the negative relationship between outcome uncertainty and buyer satisfaction.

2.2.2 Combined Effects of Performance-based and Behavior-based Contracting

Most studies adopting agency theory are typically based on the longstanding assumption that PBC and BBC are mutual substitutes (Cardinal, Kreutzer, and Miller, 2017; Choudhury and Sabherwal, 2003). This so-called singular view on contracting is increasingly criticized in the literature for not reflecting empirical reality where different forms of contracting or control co-exist in the same inter-organizational relationship (Sitkin et al., 2010), for instance in order to share different types of risks (De Jong et al., 2014). One example of a service triad in which PBC and BBC have been combined successfully concerns a train operator, which contracts the services of a cleaning services supplier. In this service triad, contracted cleaning services are delivered directly to passengers while trains are in service. The train operator combined PBC and BBC to ensure that cleaning quality targets were met (PBC) and that safety requirements were adhered to (BBC) (Nullmeier et al., 2016).

A recent meta-analysis of controls, both in intra-organizational and inter-organizational settings, reveals that PBC and BBC have complementary effects on performance (Sihag and Rijdsdijk, 2018). Specifically, for buyer-supplier relations, Handley and Gray (2013) investigate the complementarity in use and in effectiveness of output (or performance) and process (or behavior) controls. In their study of quality management practices, they find support for a substitution effect in use between output-oriented quality controls and process-oriented quality controls. However, they also find moderate support for the complementary effectiveness of output-oriented

and process-oriented controls. In their multiple case study of contracting in service triads, Broekhuis and Scholten (2018) also suggest that combining PBC and BBC can help in achieving satisfactory performance. In a theory-building study, Whipple and Roh (2010) identify four different outsourcing scenarios characterized by different levels of outcome measurability (i.e., the degree to which performance outcomes are difficult to measure or difficult to measure within a limited amount of time) and outcome uncertainty. Using these scenarios, they develop the proposition that a combination of PBC and BBC is most effective when both outcome measurability and uncertainty are low, or when both are high. Overall, however, there are very few empirical studies investigating the combined effects of PBC and BBC, let alone studies testing the specific contingencies or task characteristics affecting these interactions.

We therefore propose and empirically validate the combined effects of PBC and BBC, in particular how that combination would affect the impact that outcome uncertainty has on supplier shirking, and thereby on buyer satisfaction. Moreover, building on the recent work of Sumo et al. (2016), we propose to distinguish two phases of contracting in investigating these effects: contract design and contract management or execution. The distinction between these two phases is important since behaviors and performance targets for outsourced services cannot always be fully defined in advance because of their dynamic nature (cf. Carson, 2007). It is therefore that what is monitored during the contract management phase can differ substantially from what was specified during the contract design phase (Bonner, Ruekert, and Walker Jr, 2002). While a buyer may have designed a predominantly performance-based contract at the start of an exchange, it may

introduce additional behavior monitoring during contract execution when it feels that performance targets are not met (Sumo et al., 2016).

Distinguishing between these two phases is especially important in the case of service triads as the nature of triadic arrangements means that the buyer gradually relinquishes direct involvement in service delivery, delegating this to the service supplier (Li and Choi, 2009). Put differently, in the contract management phase, the supplier gradually positions itself between the buyer and the customer. While the contract that the buyer has established with the supplier during the contract design phase is expected to guide the exchange process between supplier and end-customer (by defining either the performance to be achieved, and/or the behavior/processes to adopt), these changing interaction patterns mean that during the subsequent contract management phase the opportunities for monitoring to ensure proper service delivery and appropriate supplier behavior may change (Van der Valk and Van Iwaarden, 2011; Li and Choi, 2009). When studying the effects of contracting on shirking behavior, it is therefore helpful to distinguish between what has been specified in a contract during the contract design phase and the type of control mechanisms that are actually used to measure, monitor and evaluate performance outcomes and behaviors during the contract management phase (Carson, 2007; Glas, Henne, and Essig, 2018). Hence, we use two pairs of constructs to capture what happens in the respective phases. For the contract design phase, we use performance vs. behavior specification, namely the ‘performance outcomes to be achieved and incentives tied to the achievement of outcomes’ and the ‘behaviors (i.e., processes and procedures) to be adhered to.’ For the contract management phase, we use performance vs. behavior evaluation, namely the

measurement, monitoring and evaluation of ‘performance outcomes achieved’ and ‘behaviors used to achieve performance outcomes’ (Dekker and Van den Abbeele, 2010; Ouchi, 1979).

The contracting literature is somewhat divided on how shirking of responsibility is affected by specifying during the contract design phase not only the desired performance outcomes but also what behaviors are required of suppliers. On the one hand, adding behavior specification to the mix can be beneficial since it (1) reduces the information asymmetry between buyer and supplier, (2) reduces the risk for suppliers of not being rewarded for the effort invested and (3) enables buyers to use their specialist expertise to provide guidance to suppliers to complete specific tasks (Bello and Gilliland, 1997; Ramaswami, 1996; Whipple and Roh, 2010). Following this line of reasoning, one would conclude that combining performance and behavior specification weakens the shirking inducing effect of outcome uncertainty. On the other hand, imposing specific procedures can be counterproductive since it places constraints on the supplier’s ability to use its expertise to structure processes in the most effective way (Bonner et al., 2002; Sumo et al., 2016; Tiwana and Keil, 2007). Following this line of reasoning, one would conclude that combining performance and behavior specification strengthens the shirking inducing effect of outcome uncertainty. Based on these insights, we formulate the following competing hypotheses:

Hypothesis 3a. Behavior specification moderates the effect of performance specification such that this combination of contractual controls weakens the indirect effect of outcome uncertainty on buyer satisfaction through shirking of responsibility by suppliers.

Hypothesis 3b. Behavior specification moderates the effect of performance specification such that this combination of contractual controls strengthens the indirect effect of outcome uncertainty on buyer satisfaction through shirking of responsibility by suppliers.

There is a similar division over how the shirking inducing effect of outcome uncertainty is affected by evaluating both performance and behavior during the contract management phase. Studies that adopt a singular view on contractual controls argue that performance evaluation decreases shirking, whereas behavior evaluation increases shirking (e.g., Aiken and Hage, 1966; Heide, Wathne, and Rokkan, 2007). Few studies have, however, researched how these two contractual controls interact. Hirst (1981, 1983) argues that contractual controls should not only signal to the supplier that performance outcomes have not been achieved, but should also be accompanied by some discussion of why those performance outcomes were not achieved and how this can be corrected in the future. Engaging in such constructive discussions about shortcomings in procedures is particularly important in service triads since suppliers are dependent on buyer and customer inputs (Li and Choi, 2009; Niranjana and Metri, 2008).

Therefore, evaluation of behavior can help to build mutual understanding and can help suppliers to feel they are being treated fairly (Long, Bendersky, and Morrill, 2011; Ramaswami, 1996). Following this line of reasoning, one would conclude that combining performance and behavior evaluation weakens the shirking inducing effect of outcome uncertainty. On the other hand, it has been argued that behavior evaluation

may be perceived as obtrusive since it limits the supplier's autonomy (Anderson and Oliver, 1987; Sumo et al., 2016; Van der Valk and Iwaarden, 2011). This may hinder the supplier's ability to make adjustments needed during the early stages of a project and can ultimately result in performance outcomes that are unsatisfactory to the buyer. Following this line of reasoning, one would conclude that combining performance and behavior evaluation strengthens the shirking inducing effect of outcome uncertainty. Based on these insights, we formulate the following competing hypotheses:

Hypothesis 4a. Behavior evaluation moderates the effect of performance evaluation such that this combination of contractual controls weakens the indirect effect of outcome uncertainty on buyer satisfaction through shirking of responsibility by suppliers.

Hypothesis 4b. Behavior evaluation moderates the effect of performance evaluation such that this combination of contractual controls strengthens the indirect effect of outcome uncertainty on buyer satisfaction through shirking of responsibility by suppliers.

These hypothesized relationships are depicted in Figure 2.1.

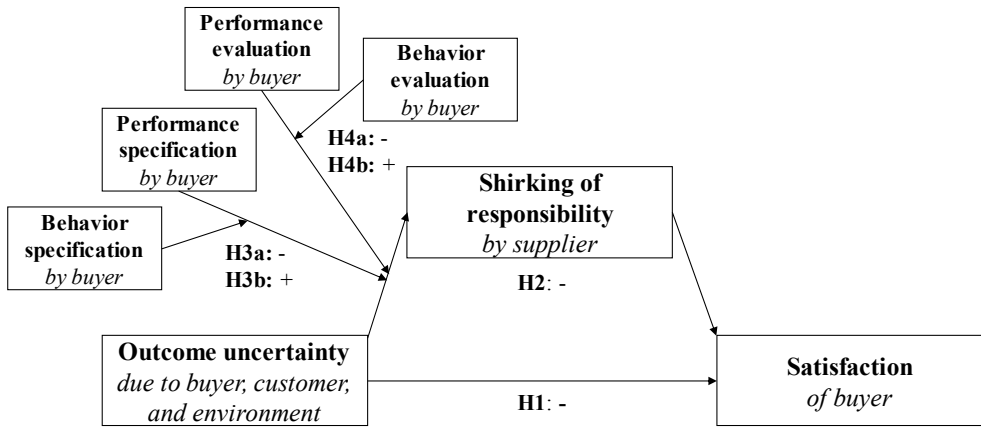


Fig. 2.1. Conceptual model

2.3 METHODOLOGY

2.3.1 Measure Development

The unit of analysis in this study is the transaction or exchange of a specific service in a given service triad. Therefore, all of the constructs are measured at the transaction level. Construct and scale development took place in four stages as articulated by Saghir (2011). First, we defined the constructs and their measured variables by conducting an extensive literature review. Operationalization of constructs has been achieved by using reflective as well as formative multiple-item measures. While formative indicators cause the latent variable, and are therefore referred to as cause indicators, reflective indicators are referred to as effect indicators and are chosen from a universe of items that are related to the construct (Diamantopoulos & Winklhofer, 2001). Items of formative constructs together form the latent construct. Formative indicators must be collectively exhaustive to form the latent variable reliably and are therefore not interchangeable (Diamantopoulos,

Riefler, & Roth, 2008; Jarvis, MacKenzie, & Podsakoff, 2003). Following prescriptions of Dillman (2000), we operationalized the constructs using single- or multi-item reflective measures based on scales used in previous research whenever possible.

While we were able to identify existing scales to measure most of our constructs, no existing scales were available to measure buyer satisfaction, performance and behavior specification, and service importance. To operationalize these constructs, we developed formative scales since these constructs meet the following four criteria formulated by Jarvis, MacKenzie, and Podsakoff (2003): (1) the direction of causality is from the indicators to the construct, (2) the indicators are not interchangeable as each refers to a different and distinctive aspect of the construct, (3) the indicators do not necessarily co-vary, and (4) the nomological net of indicators is expected to differ for each of the sub-constructs. During development, we safeguarded validity of the formative constructs by ensuring that the measurement items conceptually capture a substantial part of the domain (Diamantopoulos and Winklhofer, 2001; Rossiter, 2002). Second, we sought help from scholars and practitioners with expertise in the area of performance-based contracting to validate – in particular – our newly developed measurement scales. In two discussion rounds, we met with a mixed group of six to eight individuals. After explaining the research and its key constructs, we introduced and discussed the initial measures for all developed measurement scales. This exercise resulted in modifications to the some of the scales (as we explain below when discussing our measures), as well as minor language changes.

Finally, we pre-tested the survey in a pilot study with 16 purchasing practitioners selected from the sample frame of the large-scale survey. We

used the responses to evaluate the feasibility of the survey, the time taken, and any adverse events that occurred so that we could improve our study's design prior to actual data collection. We also used the pilot study to evaluate and validate our measurement items.

2.3.2 Measures

All items were measured using five-point Likert-type rating scales (strongly disagree-strongly agree), with the exception of Relationship Continuation, which is categorical (yes/ no) (see Appendix A for an overview of our key constructs and measurement items).

Independent variable

To measure outcome uncertainty (OUTCUNC), we used an adapted four-item reflective scale based on the works of Eisenhardt (1989a), Nilakant and Rao (1994) and Celly and Frazier (1996). Outcome uncertainty is measured by assessing the effect of external factors on service delivery outcome (Eisenhardt, 1989a), fluctuation in the outcome experienced by the end-customer and the difficulty of predicting the outcome experienced by end-customer (Celly and Frazier, 1996), and the effect of supplier effort on the outcome experienced by end-customer (Nilakant and Rao, 1994).

Dependent variable

To measure buyer satisfaction (BUYSATIS), we developed a five-item formative scale. Building on services marketing literature (Edvardsson and Olsson, 1996; Grönroos (1982), and in line with Nyaga, Whipple, and Lynch (2010), we asked informants to what extent their organization is satisfied with the service delivery process and the overall service quality. More specifically, buyer satisfaction with the delivery process, quality of service

delivery, contributions to improving processes or services, realized cost savings, and contributions to improve margin, revenue or return together form the buyer satisfaction construct.

Mediator

To measure shirking of responsibility (RESPSHIR) when problems arise, we built on the eight-item reflective scale of observed opportunism by Wang, Kayande, and Jap (2010). Five items were dropped after the discussion rounds, as participants indicated these measures to reflect malicious intent rather than seeking self-interest with guile. A three-item reflective scale remained assessing the extent to which the supplier sticks to its promises, is available, and informs the buyer when problems are encountered.

Moderators

To measure performance specification (PERFSPEC) and behavior specification (BEHSPEC), we developed two formative scales based on the empirical work of Martin (2007). We measured performance specification using a nine-item scale. Informants were asked to what extent performance targets relevant to the end-customer and the buyer, and bonuses and fines linked to these targets, had been specified in the contract. We measured behavior specification based on a four-item scale based on Argyres and Mayer (2007), who measure contractual detail in terms of task descriptions (i.e., operational, and management and control activities), communication (i.e., management reporting), and contingency planning. While our survey did include items for the latter, they were excluded from our measurement model as they were more generic in nature rather than specifically related to behaviors. Instead, we added (and maintained in our measurement model) an

item measuring the extent to which the contract contained provisions regarding supplier performance measurement.

To measure performance evaluation (PERFEVAL) and behavior evaluation (BEHEVAL), we used five-item formative scales based on the work of Dekker and Van den Abbeele (2010). Performance evaluation was measured by asking informants to what extent the supplier's performance was monitored and rewarded. Behavior evaluation was measured by asking informants to what extent the supplier operated according to specified procedures.

Control variables

Control variables were added to minimize the possibility of confounded results that limit the explanatory power of the model (Kish, 1959; Pedhazur and Schmelkin, 1991). We control for four variables that may affect the dependent variable, based on previous literature (see Atinc, Simmering, and Kroll, 2012; Specter and Brannick, 2011). First, we controlled for the buyer's size (BUYSIZE), a natural logarithm of the number of individuals employed by the buyer (Carey, Lawson, and Krause, 2011; Stouthuysen et al., 2012). Firm size reflects the financial resources the firm has access to (Contractor, Kumar, and Kundu, 2007) and the bargaining power of the buyer over the supplier (Poppo, Zhou, and Zenger, 2008).

Suppliers dealing with firms that have high bargaining power are expected to refrain from shirking, thus leading to higher buyer satisfaction. Second, we controlled for the buyer's dependence (BUYDEP) on the supplier, measuring this using a four item reflective scale (Hernández-Espallardo and Arcas-Lario, 2008; Jap and Anderson, 2007). Suppliers are expected to shirk more when dealing with buyers that are dependent on them

and these buyers are thus likely to be less satisfied. Third, we controlled for the continuation of the buyer-supplier relationship (RELCON) as this reflects the degree to which a relationship exists between buyer and supplier (Cannon, Achrol, and Gundlach, 2000; Carey et al., 2011; Stouthuysen et al., 2012). Longer-lasting relationships may help parties to build trust (Malhotra and Lumineau, 2011), which may affect shirking by suppliers and therefore buyer satisfaction. Fourth, we controlled for the relative importance of the contracted service in the buyer's overall value proposition (SERVIMP), measuring this using a three item formative scale (Stouthuysen et al., 2012). Dependence on the supplier and the relative importance of the service are added as control variables as these reflect the degree of risk the buyer is exposed to when the intended performance outcomes are not achieved by the supplier. As PBC largely shifts that risk to suppliers, a service that is deemed to be highly important involves more risk for the supplier, which increases the likelihood of shirking of responsibility and decreases buyer satisfaction.

2.3.3 Data Collection Procedure

Data were collected in collaboration with the Dutch Association for Purchasing Management (NEVI) in 2013 by means of an online questionnaire. NEVI provided us with its membership list containing the names and telephone numbers of Dutch purchasing professionals. Working with a professional association membership list greatly increased our chances of getting informed individuals with relevant information and backgrounds (Montabon, Daugherty, and Chen, 2018). A total of 1,518 purchasing professionals were contacted by phone to establish (1) whether they were at that point in time involved in a buyer-initiated service triad, where

contracting was done through some form of PBC and (2) whether they would be willing to participate in the study. Individuals that met both criteria were asked to select a contractual relationship for which 1) they had been involved in purchasing the service, 2) the contractual relationship had been ongoing for at least a year, and 3) the supplier was the primary supplier and there were at most two other suppliers of the same service. The individual's contact details and the selected contractual relationship (i.e., type of service and name of supplier) were then recorded. Informants were subsequently sent a link to the online questionnaire. To ensure that questions were answered in relation to the specific contractual relationship that had been selected, informants were reminded at the start of the questionnaire which service and supplier had been selected. Data for all constructs were collected from the perspective of purchasing managers since our constructs are monadic in nature (Flynn, Pagell, and Fugate, 2018).

Of the 1,518 purchasing professionals we contacted, 410 indicated that they had experience with PBC in service triads. Of these 410 purchasing managers, 369 indicated their willingness to participate in our study. These informants were reminded three times; twice via email, then a final reminder via telephone. This resulted in responses from 120 purchase managers (response rate: 33 percent). After deleting responses with missing data, we had a final sample consisting of 92 responses (effective response rate: 25 percent). Table 2.1 lists the industries and services represented in this sample. The organizations represented have an average total revenue of €2.2 billion (fiscal year 2012), and 69% of them employ more than 250 people. On average the purchasing spend of these organizations is €897 million (fiscal year 2012). All the buyers and their suppliers are located in the Netherlands,

which means that national cultural differences and geographic dispersion do not affect these outsourcing relationships.

Table 2.1

Industries and services represented in the sample

Industry (SIC)			
Agricultural services	2%	Health services	9%
Amusement and recreation services	1%	Heavy construction, excl. building	2%
Business services	14%	Insurance carriers	2%
Chemicals and allied products	1%	Oil and gas extraction	1%
Communications	5%	Railroad transportation	7%
Educational services	14%	Real estate	1%
Electrical services	2%	Service, NEC	1%
Engineering and management services	13%	Social services	1%
Executive, legislative and general government	8%	Transportation equipment services	1%
Food and kindred products	1%	Wholesale trade-durable goods	1%
General building contractors	1%	Wholesale-trade non-durable goods	2%
Service			
Catering	9%	IT	2%
Cleaning	16%	Legal	1%
Consultancy	5%	Maintenance and repair	9%
Delivery	4%	Marketing	2%
Facility management	2%	Production	1%
Financial services	1%	Software	1%
Healthcare	4%	Transportation	11%
Home care	3%	Other	17%
Installation	7%		

In terms of sectors our sample is quite heterogeneous, which is consistent with the relevant theoretical domain for our propositions: all buyer-initiated service triads that use some degree of performance-based contracting. As in any cross-sectional study, our findings may in principle be confounded by unobserved heterogeneity. That is why we explicitly control for (four) specific triad characteristics as mentioned above, which we explicitly motivate from previous research (see Atinc et al., 2012; Spector and Brannick, 2011). Based on the extant conceptual and empirical literature on service triads and contracting, we have no a priori reason to include the type of sector as a control variable. Nevertheless, we decided to run an additional check to see whether we could pool the data for the private and public sector observations; the data set contains data on both public (47.7 percent) and private (52.3 percent) organizations. The *t*-test we conducted shows there to be no significant differences between means of our study variables when comparing public and private organizations: OUTCUNC ($t(90) = -1.63$, $p = .106$), BUYSATIS ($t(90) = 1.20$, $p = .233$), RESPSHIR ($t(90) = .67$, $p = .507$), PERFSPEC ($t(90) = -1.92$, $p = .058$), BEHSPEC ($t(90) = -1.37$, $p = .175$), PERFEVAL ($t(90) = -1.94$, $p = .056$), BEHEVAL ($t(90) = -.131$, $p = .896$). We therefore integrated the private and public sub-samples into a single sample.

2.3.4 Non-response Bias

To assess the possibility of non-response bias, we compared the responses of early respondents (before the first reminder) and late respondents (after the first reminder) in terms of our main predictor variables and the size of the organization (Armstrong and Overton, 1977). Our *t*-test showed that there

were no significant differences between early and late respondents in terms of the means of OUTCUNC ($t(90) = -.85$, $p = .400$), BUYSATIS ($t(90) = 1.31$, $p = .193$), RESPSHIR ($t(90) = -.80$, $p = .423$), PERFSPEC ($t(90) = .09$, $p = .930$), BEHSPEC ($t(90) = -.63$, $p = .529$), PERFEVAL ($t(90) = .07$, $p = .947$), BEHEVAL ($t(90) = -.76$, $p = .449$), and BUYSIZE ($t(90) = .15$, $p = .880$). It should be noted that this test is based on the assumption that late respondents are representative of non-respondents. To verify whether this assumption is met, an additional test can be conducted in which key characteristics of organizations contained in the sample are compared to a benchmark of all organizations in the sampling frame (Petersen, Handfield, and Ragatz, 2005). As we did not have access to this benchmark data (it is not in the NEVI membership records), such an additional test could not be conducted. The results of this non-response bias test therefore provide some support (but not clear-cut evidence) that our data are not affected by non-response bias.

2.3.5 Construct Measurement Qualities

We assessed the reliability of the reflective constructs by calculating Cronbach's α values. The reliability of each construct was satisfactory, with a composite reliability of at least .8 (Lance, Butts, and Michels, 2006; Nunnally, 1978). To assess convergent validity, we computed the average variance extracted (AVE) for each of the reflective constructs. As shown in Appendix A, all the AVEs exceeded the recommended minimum level of .5, indicating a sufficient level of convergent validity (Fornell and Larcker, 1981). Finally, to test the discriminant validity of the reflective constructs, we compared the correlation between constructs with the square root of the

AVE. Table 2.2 provides the descriptive statistics for our constructs. This table demonstrates that the square root of the AVE for each construct was greater than the correlations, indicating a satisfactory level of discriminant validity. Overall, the measurement model thus exhibits sufficient reliability and validity.

We safeguarded the validity of our formative constructs by examining content validity as well as the multi-collinearity among the measurement items (Diamantopoulos and Winklhofer, 2001; Diamantopoulos et al., 2008). The expert discussion rounds and the pretest had already demonstrated the suitability of formative measurement scales that had been developed (i.e., content validity). We assessed multi-collinearity by calculating the variance inflation factors (VIF) and bivariate correlations between measurement items and the respective construct (Cenfetelli and Bassellier, 2009). The VIF values for our formative constructs were as follows: 1.05–2.34 (BUYSATIS), 1.07–1.49 (PERFSPEC), 1.04–2.26 (BEHSPEC), 1.08–1.52 (PERFEVAL), 1.08–2.37 (BEHEVAL), and 1.24–2.38 (SERVIMP). These VIFs are satisfactory, even for our relatively small sample size (Guide and Ketokivi, 2017). The bivariate correlations, which are reported in Appendix A, reveal that all measurement items are positively correlated with their respective construct. Therefore, we conclude that these indicators are important and valid facets of our constructs' domains.

Table 2.2
Descriptive statistics

	Mean	SD	Square root of AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) OUTCUNC	2.92	.72	.75	1										
(2) BUYSATIS	17.88	2.57	N/A	-.301**	1									
(3) RESPSHIR	1.98 ^a	.74	.79	.267**	-.485**	1								
(4) PERFSPEC	20.66	8.60	N/A	-.057	.077	-.221*	1							
(5) BEHSPEC	12.86	3.39	N/A	-.171	.247*	-.194	.439**	1						
(6) PERFEVAL	18.42	3.51	N/A	-.002	.150	-.235*	.717**	.326**	1					
(7) BEHEVAL	18.76	3.22	N/A	-.160	.161	-.115	.211*	.341**	.339**	1				
(8) BUYSIZE	6.45 ^b	2.28	N/A	.003	-.096	-.022	.322**	.109	.287**	.024	1			
(9) BUYDEP	4.25 ^c	.78	.80	-.015	-.067	.120	-.022	-.095	-.059	.020	-.155	1		
(10) RELCON	.53 ^d	.50	N/A	.059	.061	.051	-.013	-.206	.194	.116	.048	-.051	1	
(11) SERVIMP	11.03	2.50	N/A	.093	.167	-.084	.094	-.097	.098	-.016	-.075	.068	-.050	1

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$.

^aBased on 1–7 scale.

^bNatural log of the number of employees

^cBased on 1–10 scale.

^dBased on a yes/no (1/0) scale

All others based on 1–5 scale (see Appendix A for further details).

2.3.6 Common Method Bias

Using single informants can enable the researcher to obtain pragmatic experience-based inputs from people who know what is going on within their firm (Montabon et al., 2018). However, the use of single informants to measure information for multiple variables based on perceptual measures can potentially be a source of systematic measurement error (Flynn et al., 2018). Common method bias (CMB) can be addressed most effectively during the research design phase (Montabon et al., 2018). We therefore took several measures at the survey design stage to minimize the effect of CMB. First, we ensured full anonymity for our respondents (Podsakoff et al., 2003).

Second, we targeted purchasing managers and asked them to answer questions about a specific contractual relationship in order to improve the credibility of the answers (Narayanan et al., 2011). We instructed informants to select a contractual relationship in which they had been involved recently. Third, questions relating to distinct constructs were asked on separate pages of the questionnaire to reduce the likelihood of item priming effects (Podsakoff et al., 2003). Fourth, we employed scale formats and anchors that were most appropriate for each question. Obtaining secondary data on outcome variables was not possible, mainly due to the perceptual nature of our dependent variable (buyer satisfaction).

To detect whether these measures minimized the effect of CMB, we employed Lindell and Whitney's (2001) post-hoc statistical strategy for detecting CMB. This technique checks for CMB by correcting bivariate correlations between the study's variables by subtracting correlations between the marker variable, a theoretically unrelated variable and the study

variables. If the corrected correlations become insignificant when compared to the uncorrected correlations, CMB is detected (Richardson, Simmering, and Sturman, 2009). To detect CMB, we used ‘end-customer dependence on the supplier’ as a marker variable. The output of the correlational marker technique provided no evidence of CMB since none of the corrected correlations became insignificant.

2.4 ANALYSIS AND RESULTS

2.4.1 Direct Effect Analysis

To test our baseline hypothesis that outcome uncertainty is negatively related to buyer satisfaction, we performed hierarchical regression analyses. For the first model, buyer satisfaction was regressed on the control variables. We then included outcome uncertainty in the second model. We checked for multi-collinearity of independent and control variables by examining the VIF values. We found that the VIF scores ranged between 1.01 and 1.04. Since these scores indicate little or no inflation arising from collinearity of predictors, we conclude that multi-collinearity is not an issue (Guide and Ketokivi, 2015). We tested for heteroscedasticity using the recommended Breusch–Pagan test (Breusch and Pagan, 1979). There was not an issue with heteroscedasticity ($BP = 3.87$, $df = 4$, $p = 0.424$). The regression results (Table 2.3) provide support for hypothesis 1, since outcome uncertainty is shown to have a negative effect on buyer satisfaction ($b = -1.13$, $\beta = -.32$, $p = .002$, $95\% \text{ CI} = -1.86 \text{ to } -.51$).

Table 2.3

Regression results from the direct effect analysis

Dependent variable		Model 1		Model 2	
Buyer satisfaction		<i>b</i>	S.E.	<i>b</i>	S.E.
(Intercept)		18.593**	.856	18.557**	.815
Control variables					
BUYSIZE	c ₁	-.146	.120	c ₁	-.150
BUYDEP	c ₂	-.208	.354	c ₂	-.221
RELCON	c ₃	.425	.539	c ₃	.531
SERVIMP	c ₄	.108	.109	c ₄	.141
Independent variable					
OUTUNC				c	-1.130**
R ²		.032			.133
Adj. R ²		-.012			.083
R ² change		.032			.101**
F		.724			10.151

Notes: Significance levels: * $p < 0.05$. ** $p < 0.01$. Unstandardized regression coefficients reported

2.4.2 Mediation Analysis

To test whether shirking of responsibility mediates the negative relationship between outcome uncertainty and buyer satisfaction, we carried out mediation analysis. The regression results are presented in Table 2.4 (Model 3); where the first column of regression coefficients refers to the relations with responsibility shirking as dependent variable (paths a in the mediation model) and the second column of regression coefficients refers to the relations with buyer satisfaction as dependent variable (paths b in the meditation model).

In the next step, we followed the recommendations of Hayes (2013, 2018) to use bootstrapping to detect mediation by computing the confidence interval of the indirect effect. While several approaches can be used to test

for mediation, bootstrapping is the preferred method due to its low sample size requirement and the fact that it does not rely on the assumption of asymptotic normality (Malhotra et al., 2014; Rungtusanatham, Miller, and Boyer, 2014). We therefore tested for mediation using Hayes's (2013) PROCESS bootstrapping macro. We find evidence of mediation since the 95% bootstrapping confidence interval for the indirect effect lies between -.74 and -.07 (adjusted $R^2 = .181$, $p = .000$) (to conserve space, the indices are not repeated in Table 2.4). While research often distinguishes between full and partial mediation, Rungtusanatham et al. (2014) argue that this is not appropriate since full mediation can never be truly tested. We therefore do not make this distinction.

2.4.3 Moderation Analysis

To test whether combining contracting approaches helps to prevent suppliers shirking their responsibility, we carry out conditional process analysis (Hayes, 2018). Conditional process analysis is an analytical strategy that seeks to quantify the boundary conditions of mechanisms. This is done by testing whether the effect of a mechanism (i.e., shirking of responsibility) is contingent on other factors. More specifically, moderated mediation occurs when the strength of a mediation process differs at specific levels of a moderator, which is also known as a conditional effect (Muller, Judd, and Yzerbyt, 2005).

Moreover, our hypotheses 3-4 propose that the indirect effect of shirking on buyer satisfaction is conditional not on a single factor or moderator, but a combination of moderators: the combination of behavior and performance specification, and the combination of behavior and performance evaluation. In other words, we are proposing moderated moderated mediation effects. Using the index of moderated mediation (Hayes, 2018), we establish whether the moderation of the indirect effect of outcome uncertainty on buyer satisfaction by performance specification is conditional on behavior specification. Likewise, we also establish whether the moderation of the indirect effect of outcome uncertainty on buyer satisfaction by performance evaluation is conditional on behavior evaluation. If the index of moderated mediation provides evidence of moderated moderated mediation, we probe the interaction to establish whether there is evidence of conditional moderated mediation. This is done using the conditional moderated mediation index, which quantifies the linear relationship between a specific moderator and the indirect effect at a low, medium and high value of the second moderator.

Model 4 (see Table 2.4) tests for moderated moderated mediation of performance and behavior specification. Again, the first column of regression coefficients refers to the relations with responsibility shirking as dependent variable (paths a in the mediation model) and the second column of regression coefficients refers to the relations with buyer satisfaction as dependent variable (paths b in the meditation model). The regression coefficient for the three-way interaction (a_6) is not significant, but following Hayes (2018) it is more appropriate for small samples like ours to consider the moderated moderated mediation index. As the confidence interval of this

index includes zero ($-.022$, 95% CI = $-.062$ to $.011$), there is no evidence of moderated moderated mediation for the two types of specification (to conserve space, the indices are not repeated in Table 2.4). That is, our results do not provide support for Hypothesis 3a or for Hypothesis 3b.

Model 5 tests for moderated moderated mediation of behavior and performance evaluation. As can be seen in Table 2.4, the explanatory power of this second moderated moderated mediation model increases substantially in comparison to the baseline mediation model (R^2 increases from $.101$ to $.238$). Again, the regression coefficient for the three-way interaction (a_6) is not significant, but following Hayes (2018) we primarily consider the moderated moderated mediation index. This index provides evidence of moderated moderated mediation ($-.008$, 95% CI = $-.022$ to $-.001$; to conserve space, indices not repeated in Table 2.4).

Based on this result, we probe for evidence of conditional moderated mediation. We do this by subsequently considering the moderation by each of the two factors (behavior evaluation and performance evaluation) of the other factors' moderating effect. We do this for completeness, even though our conceptual model, strictly speaking, has specified a 'primary' and a 'secondary' moderator within H4 (and H3, for that matter). This step reveals two conditional effects. First, the conditional moderated mediation index of performance evaluation reveals that performance evaluation moderates the indirect effect when there is a low level of behavior evaluation. This first conditional moderated mediation effect is illustrated in Figure 2.2. While performance evaluation does not moderate the indirect effect when a medium ($.031$, 95% CI = $.000$ to $.083$) or high level ($.004$, 95% CI = $-.042$ to $.050$) of behavior evaluation is used, performance evaluation weakens the negative

indirect effect when a low level (.059, 95% CI = .013 to .138) of behavior evaluation is used. Consequently, the moderating effect of performance evaluation is conditional on there being a low level of behavior evaluation.

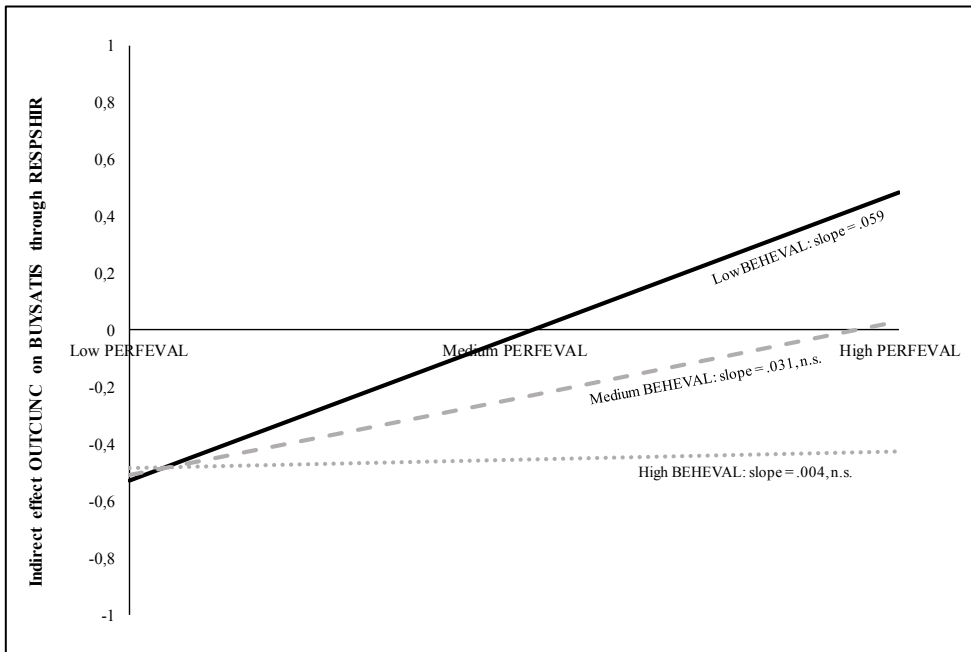


Fig. 2.2. Visualization of conditional moderated mediation.

Second, the conditional moderated mediation index of behavior evaluation reveals that behavior evaluation moderates the indirect effect, if a high level of performance evaluation is used. This second conditional moderated mediation effect is illustrated in Figure 2.3. While behavior evaluation does not moderate the indirect effect when a low (.007, 95% CI = -.083 to .112) or medium level (-.064, 95% CI = -.158 to .015) of performance evaluation is used, behavior evaluation strengthens the negative indirect effect when a high level (-.133, 95% CI = -.314 to -.025) of

performance evaluation is used. Consequently, the moderating effect of behavior evaluation is conditional on using a high level of performance evaluation.

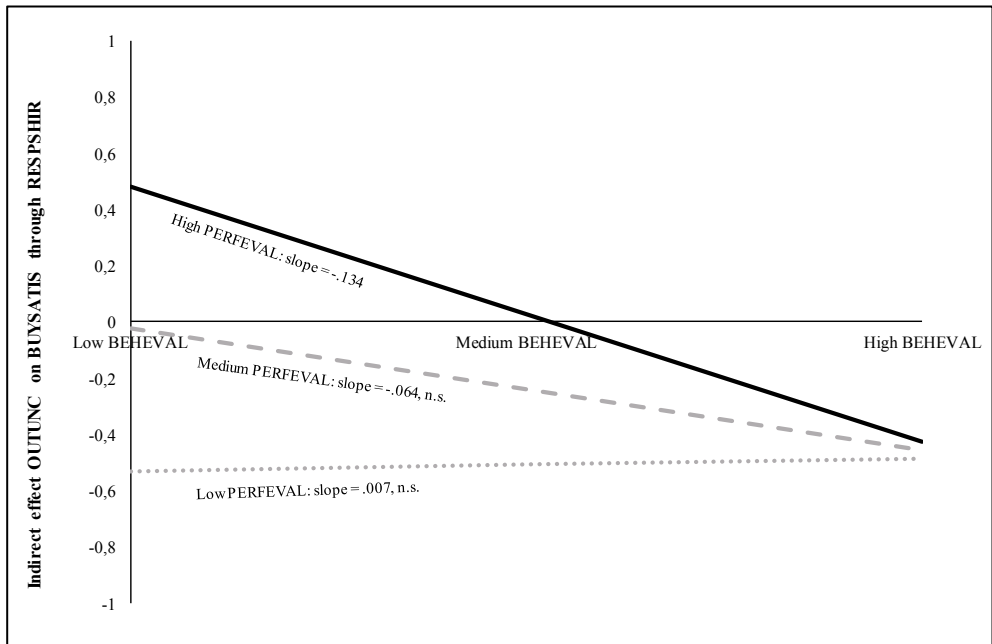


Fig. 2.3. Visualization of conditional moderated mediation.

Based on these results we conclude that using performance evaluation in combination with behavior evaluation can both weaken and strengthen the indirect effect of outcome uncertainty on buyer satisfaction through shirking of responsibility. Figure 2.2 reveals that for a given low level of behavioral evaluation, increasing the amount of performance evaluation will weaken the (indirect) negative effect of outcome uncertainty on buyer satisfaction, supporting Hypothesis 4a. In contrast, Figure 2.3 reveals that for a given high level of performance evaluation, increasing the amount of behavioral evaluation will strengthen this (indirect) negative effect, supporting

Hypothesis 4b. The moderated moderated mediation effects are not significant in the other situations (gray lines in Figures 2.2 and 2.3).

2.5 DISCUSSION AND CONCLUSION

2.5.1 Theoretical Contributions

PBC is used in service triads for the purpose of motivating suppliers in order to deliver superior performance (Selviaridis and Wynstra, 2015; Wynstra et al. 2015). Specifically, it is achieved by implementing a payment model that shifts responsibility to suppliers (Sumo et al., 2016). Since linking pay to performance can expose suppliers to considerable financial risk, this method of contracting has long been deemed ineffective in achieving satisfactory performance outcomes, when performance outcomes are not (entirely) under the control of suppliers (Eisenhardt, 1989a; Zu and Kaynak, 2012). We tested this notion in relation to service triads, where there is outcome uncertainty due to both buyers and suppliers being involved in providing the service (Bastl, Johnson and Finne, 2019). While our study confirms that PBC is less effective to induce suppliers to deliver satisfactory performance outcomes when performance outcomes are uncertain (H1 is supported), we find that the supplier's propensity to engage in shirking behavior can be mitigated by using particular combinations of PBC and BBC. Our findings hold several implications for theory.

First, this study increases our understanding of the behavioral mechanism by which outcome uncertainty decreases the effectiveness of PBC in the context of service triads. Our results reveal that outcome uncertainty leads suppliers to shirk their responsibilities, as it increases the

financial risk that they are exposed to and thus leads to poorer performance (Eisenhardt, 1989a; Ross, 1973; Wang and Yang, 2013).

Second, we find that the specific ways in which PBC and BBC are combined determines how outcome uncertainty affects supplier behavior. In contrast to prior contracting literature (e.g., Argyres and Mayer, 2007), our study focuses on the effectiveness of contractual controls during contract design and the subsequent contract management phase. This enables us to explicate what should be specified during the contract design phase and what should be monitored and evaluated during the contract management phase (Carson, 2007). While we find no evidence that combining performance and behavior specification mitigates the shirking inducing effect of outcome uncertainty, our results reveal that combining performance and behavior evaluation can have such a mitigating effect. This means that monitoring and evaluation activities are an important mechanism by which buyers can mitigate supplier shirking in service triads (Van der Valk and Iwaarden, 2011). Moreover, our results reveal that this ‘mitigation effectiveness’ of monitoring and evaluation activities depends on how the different forms of contractual controls are precisely combined during the contract management phase.

For a given low level of behavioral evaluation, increasing the amount of performance evaluation will weaken the (indirect) negative effect of outcome uncertainty on buyer satisfaction. This corroborates earlier findings on the favorable effects of output monitoring on customer-supplier relations and supplier performance (Heide et al., 2007; Tiwana and Keil, 2007). At the same time, retaining a minimum for of behavioral evaluation seems useful, in line with Hirst (1981, 1983). Effective monitoring and evaluation should

not only signal whether outcomes have been achieved, but be accompanied by discussion of how this can be improved in the future (Uenk and Telgen, 2018).

For a given high level of performance evaluation, increasing the amount of behavioral evaluation will strengthen the (indirect) negative effect of outcome uncertainty on buyer satisfaction. In situations where extensive performance evaluation is used, applying also extensive evaluation of behavior is counterproductive since this restricts supplier autonomy (Sumo et al., 2016; Whipple and Roh, 2010). With extensive behavioral evaluation, adherence to buyer-specified inputs, activities or processes is typically evaluated, restricting the supplier's freedom to employ processes that it deems to be most appropriate. As the supplier's autonomy is reduced, its ability to manage its exposure to risk is diminished. Consequently, in service triads extensive behavior evaluation leads suppliers to increasingly shirk their responsibility, as this form of evaluation overrides the positive effect of performance evaluation – even when this evaluation is extensive (Frey, 1993). Our research findings are summarized in Figure 2.4.

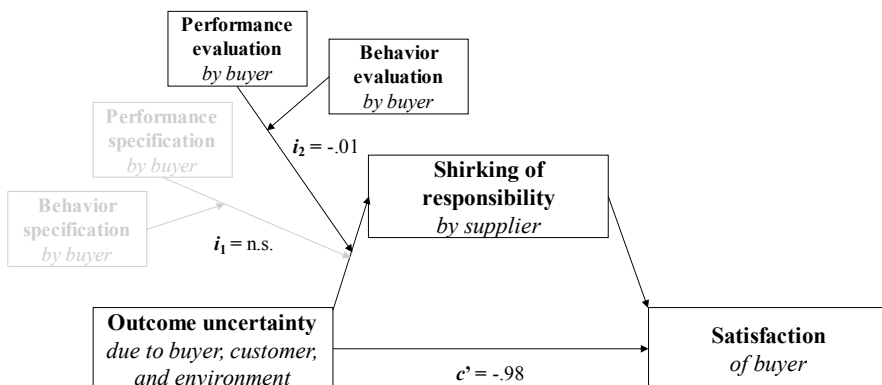


Fig. 2.4. Research results (i = moderated moderated mediation index)

2.5.2 Managerial Contributions

This study provides purchasing managers with new insights into how to use PBC effectively in uncertain contexts such as service triads. Our findings have two main implications for purchasing managers.

First, to reduce responsibility shirking by suppliers (and, thereby, limit the negative effects on buyer satisfaction), buying firms do well to place particular emphasis on the contract management phase. Our findings demonstrate that it is through the application of monitoring and evaluation activities, rather than through contractual specifications, that shirking – in the context of a supplier facing uncertain performance outcomes – can be contained. In line with these implications we encourage purchasing managers to focus on the activities carried out after the contract has been drawn up and agreed. While purchasing departments typically invest considerable resources in designing and negotiating contracts, our results reveal that the way a contract is managed is the most important in determining whether the performance outcomes are achieved. This is of particular relevance in service triads, since the uncertain nature of operations can require adaptations to the contractual control mechanisms employed once the contract design has been finalized.

Second, buying organizations need to realize that the benefits of PBC, and in particular performance evaluation, are contingent on the level of behavioral evaluation. Investing in performance evaluation, while retaining high levels of behavioral evaluation (i.e. still monitoring whether the supplier followed the detailed work instructions), will have no noticeable effects on improving buyer satisfaction, to the extent that it does not reduce supplier

shirking. In situations, where extensive performance evaluation is used, adding more behavioral evaluation will even make matters worse. In other words, the best results are achieved by not only increasing monitoring of performance but at the same time reducing process or behavior monitoring. Particularly the latter may be difficult to achieve, especially for organizations that have previously conducted the supplier's activities in-house or that consider themselves experts based on other grounds.

2.5.3 Limitations and Future Research

This study has several limitations. First, the cross-sectional nature of the data used in this study prevents us from making strong causal claims. We therefore encourage replication of this study using longitudinal data. Second, the study relies on data gathered from single informants. While our results indicate that there are no clear indications of common method bias, we encourage future studies based on data triangulation. More generally, triad research would benefit from polyadic rather than monadic analysis, making data collection at (preferably) all three actors in the triad imperative. Third, this study uses perceptual measures of buyer satisfaction. While it is generally preferable to use objective data to measure this type of construct, most aspects of buyer satisfaction are not measured by organizations themselves. As an alternative, we could have relied on performance or effectiveness measures such as cost or quality, but these more specific measures are not equally relevant for the different types of services included in our sample. In addition, Sihag and Rijdsdijk (2018) find that the results of studies on control mechanisms that use self-reported performance data versus those that use archival data do not differ significantly. Fourth, the sample has

limitations in terms of its scope and size; it is limited to service triads in the Netherlands. We would like to encourage scholars to conduct additional studies to replicate our findings concerning the effective use of PBC in service triads, and to extend our findings we would also urge scholars to replicate them in other contexts.

Based on this study we suggest two main directions for future research. First, future studies could explore how a broader set of service characteristics may affect the complementary nature of PBC and BBC. Reflecting on the insignificant effects of performance and behavior evaluation leads us to believe that service complexity, for example, could lead to considerable variation in how effective performance and behavior specification might be across different types of services (Sihag and Rijdsdijk, 2018). While buyers that are contracting complex services such as social care rely mainly on behavior specification (Uenk and Telgen, 2018), such contractual controls are not as common when less complex services are being contracted. Additional research is therefore required to determine which configurations of performance and behavior specification are most effective when contracting specific types of services.

Second, future research could investigate contracting in other types of service triads. The rise of the internet has led to a rise in different kinds of triadic arrangements other than conventional buyer–supplier–customer triads. Contemporary manifestations of triads are distinctly different from buyer-supplier-customer service triads since they do not involve governance of buyer-supplier relationships. Rather, they involve one organization acting as a supplier to two or more individuals, which then exchanges services (e.g., Airbnb and Uber). At this point it is unclear whether such different

characteristics affect the configuration in which contractual controls can help to mitigate shirking.

CHAPTER 3

Outcome attributability in performance-based contracting: Roles and activities of the buying organization³

3.1 INTRODUCTION

Performance-based contracting deployed to purchase services has gained increasing attention in practice recently, but its implementation has seen mixed results (Ng and Nudurupati, 2010; Ssengooba, McPake, and Palmer, 2012). Performance-based contracts have therefore also received renewed interest in academic literature (e.g., Heinrich and Choi, 2007; Hypko, Tilebein, and Gleich, 2010; Kleemann and Essig, 2013; Selviaridis and Wynstra, 2015).

Previous research has explained performance differences between alternative contract forms primarily in relation to the characteristics of the task being contracted and the nature of the partners. Agency theory and theories on organizational control posit that performance-based contracts (outcome controls) are less effective when the supplier is risk averse, the measurability of outcome is low, and the uncertainty of the outcome is high (Eisenhardt, 1989a; Ouchi, 1979). In the case of performance-based contracting, outcomes are typically defined in terms of product (equipment) availability or reliability (Guajardo et al., 2012), product utilization (Hypko

³ This chapter has been published as Nullmeier, F. M. E., Wynstra, F., & van Raaij, E. M. (2016). Outcome attributability in performance-based contracting: Roles and activities of the buying organization. *Industrial Marketing Management*, 59, 25-36.

et al., 2010), or even customer satisfaction (Gruneberg, Hughes, and Ancell, 2007).

Outcome uncertainty – the extent to which variations in these kinds of outcomes cannot be controlled by the inputs and efforts of the supplier – is a central characteristic in defining the effectiveness of a performance-based contract (Selviaridis and Norrman, 2014). While thorough empirical evidence of the effectiveness of performance-based contracting is still scarce (Guajardo et al., 2012), it appears that successful cases of performance-based contracting in the defense sector, for instance, mainly relate to assets that are operated in relatively predictable and stable conditions such as patrol vessels (Spacewar.com, 2013) and trainer aircraft (Dorn and Ekström, 2014). When performance-based contracts draw critique from suppliers, it is often because of their inability to fully control the performance based on which they are rewarded and because, for various reasons, the suppliers are not able to obtain a sufficiently high risk-premium (Gruneberg et al., 2007; Wynstra, 2015).

Outcome uncertainty has been studied in relation to selection of effective contracts, but mainly in terms of external influences and not so much in relation to the influence that buying organizations have on supplier performance. In service production, however, one key aspect is the provision of inputs by the customer, often being the buying organization (Sampson and Froehle, 2006). When buyer inputs are substantial, variations in the quality and (timely) availability of such inputs may have a severe impact on the uncertainty of the performance outcomes of the service.

What previous research has not studied in-depth either, given its predominant focus on the selection and design of contracts, is how the actual execution or management of the performance-based contract can attenuate

some of the negative effects that outcome uncertainty would have on the level of supplier inputs and effort and thereby performance outcomes. Anecdotal evidence, at least, suggests that how the contract is actually being managed—for instance, in terms of the way penalties are enforced—has a strong impact on the actual outcomes (Houtekamer, 2015).

To address these two gaps, this paper seeks to make two contributions. First, it investigates how the outcome uncertainty of a service production process relates to the roles of the buying organization in service design and production, particularly in terms of providing inputs for the service exchange (Sampson and Spring, 2012). We provide a synthesis of literatures on contracting on the one hand (agency theory and theories on organizational control) and service operations management on the other, to better understand those antecedents of outcome uncertainty that are internal to the buyer-supplier relationship.

The paper also identifies specific activities in managing (performance-based) contracts, and how and to what extent such activities can enhance the effectiveness of a performance-based contract, in a context (high outcome uncertainty) where traditionally such a contract (outcome control) has been argued to not be effective. By identifying the activities for managing performance-based contracts, we aim to complement the literature that has so far focused on design and selection of these contracts.

On the basis of literature, we develop theoretical predictions. In order to elaborate these theoretical predictions into a conceptual model (Ketokivi and Choi, 2014), we study contract management practices through a multiple case study. The two cases involve cleaning services contracted by a train operator and a university hospital. In the remainder of this paper, we first

review prior literature to develop theoretical predictions. Subsequently, we discuss research design, the cases and case analysis. The final two sections discuss our findings and our conclusions.

3.2 LITERATURE REVIEW

3.2.1 Uncertainty and Attributability of Performance Outcomes

Various theoretical frameworks are relevant to the study of performance-based contracting (Selviaridis and Wynstra, 2015). Out of these, agency theory (Jensen and Meckling, 1976) and theories on organizational control (Ouchi, 1979) have specifically investigated the situational characteristics that determine the optimal form of contract or control – behavior versus outcome. Eisenhardt (1989a) developed a synthesis of these theories, and proposed that an outcome-based contract is more effective in situations of high outcome measurability, high goal incongruence, and buyer risk-averseness. A behavior-based contract is more effective when there is high task programmability, high outcome uncertainty, high information availability, supplier risk-averseness, and a long-term relationship.

Outcome uncertainty has become a central consideration in research on the effectiveness of performance-based contracts (outcome contracts), particularly because of its close association with the propensity of suppliers to accept risk (Selviaridis and Wynstra, 2015): “The issue of risk arises because outcomes are only partly a function of behaviors. [...] as uncertainty increases, it becomes increasingly expensive to shift risk despite the motivational benefits of outcome-based contracts” (Eisenhardt, 1989a, p. 61). Outcome uncertainty in this context is exclusively defined in relation to external factors: “Government policies, economic climate, competitor

actions, technological changes, and so on, may cause uncontrollable variations in outcomes” (Eisenhardt, 1989a, p. 61; see also Celly and Frazier, 1996).

However, also the behavior of the customer (the principal in the principal-agent relationship) may be a source of uncertainty. Particularly when the customer-supplier exchange involves a service, the customer can have a strong impact on the effectiveness of the efforts of the supplier, as the customer contributes inputs to the service production process. Any (unplanned) variations in the quality and availability of such inputs may create additional uncertainty for the supplier. Sampson and Froehle (2006) have distinguished three types of these inputs: “the customer's self, its belongings or other tangible objects, and information” (p. 332). Unified Service Theory (UST) suggests that this presence of customer inputs—and its consequences—is the unique factor distinguishing service processes from non-service processes (Sampson, 2000; Sampson and Froehle, 2006). Still, across different service production processes, the relative importance of each type of inputs (human assets, physical objects, and information), and the extent to which a service production depends on these inputs, may vary. The more important customer inputs are for a service production process, the more factors affect service outcomes, and hence the larger the outcome uncertainty.

In a recent study of logistics services, for instance, Selviaridis and Norrman (2014) find that indeed one of the main antecedents of outcome uncertainty is the service provider's control over input and behavior of customers. Selviaridis and Norrman (2014) refer to outcome uncertainty as (the inverse of) performance attributability. The more limited the impact of

other factors, besides the efforts of the supplier, on the performance outcome of the service production process, the higher the attributability of the performance outcome. In line with the propositions from agency theory and theories on organizational control, Selviaridis and Norrman (2014) develop the proposition that low attributability of performance outcomes makes service providers less willing to accept financial risks as embedded in performance-based contracts. Low performance attributability is also argued to lead to increased emphasis on relational governance based on information sharing, collaboration and trust, which in turn make providers more willing to accept the risks of performance-based contracts.

We build on this literature in two ways. First, we elaborate on the impact of customer inputs and roles as antecedents of performance attributability or outcome uncertainty. Second, we explicate the impact of specific activities related to contract management in moderating the impact of customer roles on outcome uncertainty – and the impact of outcome uncertainty on the level of supplier inputs and effort, which in turn affects performance outcomes.

3.2.2 Roles of the Customer

In the context of service production, outcome uncertainty is strongly influenced by the inputs that the customer needs to provide for service production. The amount and type of customer inputs relates to the task or role distribution between the customer and the supplier in the service development and production process. Service operations management literature has distinguished seven supply chain roles that customers assume in service supply chains, and which are directly related to the inputs

customers provide for the service development and production process: design engineer, production manager, labor, component supplier, inventory, product, and quality assurance (Sampson and Spring, 2012).

Customers acting as ‘design engineer’ design services and service production processes. ‘Production managers’ plan and oversee the conversion of inputs into outputs by directing the service delivery. The ‘labor’ role applies to situations in which customer and supplier engage in co-production and the customer assists, operationally, in the actual production of services (Grönroos, 2008). Customers in the role of ‘component supplier’ provide essential process components without which the service cannot be produced (e.g., offices as inputs for cleaning services). Customers are ‘inventory’ when they are waiting for themselves, their belongings or their information to be processed as part of a service exchange (Sampson and Spring, 2012).

The ‘product’ role applies when service providers act on the customer or the customer's organization. For example, when a consultant provides restructuring services, the restructured organizations is the product. Finally, when customers assume an active ‘quality assurance’ role, they provide ex ante specifications, and measure and evaluate quality ex post (Chervonnaya, 2003).

Of these seven customer roles, the labor, component supplier, inventory, and product roles mainly involve the input provision of human assets and physical objects. The design engineer, production manager, and quality assurance roles mainly involve the input provision of information. The more substantial these customer roles are in a given service exchange, the more important the associated customer inputs are for the performance

outcomes of the service, and thus the higher the outcome uncertainty for the supplier: the relation between its own inputs and efforts and final outcomes becomes weaker.

3.2.3 Contract Management Activities

In most theories on contracting, safeguarding is the most prominent function: contract design to minimize opportunism and to protect investments. This can be done through assigning decision and termination rights, and defining processes for dispute resolution (Schepker et al., 2014). Contracts can also serve to coordinate and align actions of the contract partners, particularly when these actions or tasks are highly uncertain and complex (Gulati and Singh, 1998; Ouchi, 1979; Mayer and Argyres, 2004). By outlining responsibilities of suppliers and customers, contracts also serve as a blueprint for exchange, aligning the actions of both parties (Macaulay, 1963; Vanneste and Puranam, 2010).

Besides enabling safeguarding and coordination, contracts can support cooperation. Gulati, Lawrence, and Puranam (2005), for instance, argues that cohesive effort between buyer and supplier “... not only requires the alignment of interests (cooperation), but also the alignment of actions (coordination)” (p. 419). Cooperation clearly relates to the function of contracts to align incentives. Agency Theory views contracts mainly as a vehicle to align incentives and to achieve risk sharing between parties involved, particularly when there is information asymmetry (Eisenhardt, 1989a; Jensen, 1983).

These three functions of contracts help identify the activities the buyer needs to execute in contract management: monitoring, enforcing,

coordination, and cooperation. Firstly, contract management encompasses activities related to contract monitoring (Reeves and Woodward, 1970). Monitoring involves gathering of supplier performance information, linked to provision of feedback (Challagalla and Shervani, 1996). Typical approaches to supplier performance monitoring include supplier audits, customer satisfaction surveys, and monitoring of complaints (Brown and Potoski, 2003). Formal contract monitoring can be defined as “establishing the extent to which contractual compliance has taken place” (Heide, 1994, p. 77). Such compliance monitoring is different from monitoring performance for benchmarking or improvement, as the first can more easily lead to enforcement actions.

Contract enforcing is the response (by the buyer) to a violation of a contractual obligation (or, positively, compliance with an obligation) by the supplier. A violation need not be the manifestation of opportunism; it can also arise because the supplier is unable to meet the obligation or is unaware of it (Antia and Frazier, 2001; Kauppi and Van Raaij, 2015). Monitoring and enforcing activities are closely related. Taken together, they fulfill the safeguarding and cooperation functions of the contract. According to Antia and Frazier (2001), “The integrity of firms' explicit contracts and the effectiveness of their coordination efforts depend to a large extent on sound enforcement practices...[yet] few studies in the marketing literature have addressed this important issue” (p. 67). This quote also leads us to the coordination activities in contract management, which closely relate to monitoring and enforcement.

Next to monitoring and enforcing, contract management includes coordinating activities related to coordination of actions of both parties

(Soeters and Griffiths, 2003). These activities include the alignment and adaptation of activities in the service production process, based on contractual provisions or following monitoring and enforcement. Even though performance-based contracts in their pure form do not specify the operational actions of suppliers, many in practice still include process prescriptions (Selviaridis and Wynstra, 2015).

Cooperating activities are activities that seek to align (or re-align) interests, objectives, and motivations of contract partners, or that facilitate such alignment. Contract monitoring and enforcement relate to the cooperation function of contracts, but there are also other mechanisms that contribute to cooperation, such as common ownership of assets. Because services entail co-production by supplier and customer, the latter can assist the supplier through a joint investment in the service delivery process (Yang, Hsieh, and Li, 2009). Such joint investment is of specific importance in dynamic markets in which customer demand changes require firms to adapt quickly (Selviaridis, Agndal, and Axelsson, 2011). Cooperation may also be facilitated through informal activities such as creating mutual identification and embeddedness (Gulati et al., 2005) through collaborating in teams and sharing of information (Randall, Pohlen, and Hanna, 2010; Guo and Ng, 2011; Randall, Nowicki, and Hawkins, 2011).

3.2.4 Effects on Performance

Synthesizing literature on service operations management and contracting, we have identified the extent to which a service customer plays a role in providing inputs in terms of human assets, physical objects, and information as antecedent to outcome uncertainty: variation in outcomes that cannot be

controlled by the supplier. The higher the uncertainty in outcomes – typically measured as availability or utilization of serviced assets or customer satisfaction – the less effective a performance-based contract. Thus, when a performance-based contract is in place, outcome uncertainty has a negative effect on performance, as there is misfit between the contract and the situational contingencies (Eisenhardt, 1989a). Such a misfit between contract and context may lead to the supplier post-contractually skimping on quality and reducing its inputs and efforts in the service exchange.

Contract management by the customer – activities related to monitoring, enforcing, coordination, and cooperation – can attenuate some of the effects of customer roles and inputs on outcome uncertainty and performance. For instance, a careful coordination of customer inputs with the supplier's service production processes can help reduce the impact of customer roles on outcome uncertainty (Selviaridis and Norrman, 2014). In order to elaborate these basic theoretical predictions into a conceptual model, we use two case studies of performance-based contracting for cleaning services.

3.3 METHODS

Theory building in industrial marketing research is characterized by the use of qualitative case studies (Dubois and Araujo, 2004; Beverland and Lindgreen, 2010). Three modes of conducting case research can be distinguished: theory generation, theory elaboration, and theory testing (Ketokivi and Choi, 2014). Theory elaboration does not seek to generate new theory or test existing theory but can be used to introduce new concept(s), examine boundary conditions, or investigate relationships between concepts

– which is what this paper does. In this theory elaboration study, empirical data have been collected through the use of the multiple case study approach (Eisenhardt, 1989b; Ellram, 1996; Yin, 2009).

3.3.1 Sampling and Data Collection

Empirical data have been collected at two (semi-)public organizations in Western-Europe, which employ performance-based contracts to purchase cleaning services. These organizations have been selected in two steps. First, we identified the target population of our study as cases of performance-based contracting for services. Convenience sampling was subsequently employed to find suitable cases in which different challenges associated with attributability were faced. The first case study, carried out at a train operator, is characterized by extensive challenges associated with attributability of performance. This is caused by the fact that the objects to be cleaned (the trains) are highly mobile—and not always predictably so. Extensive involvement of the buying organization is required to provide the supplier access to the objects to be cleaned. The second case study concerns a university hospital. This case is characterized by less pronounced challenges associated with attributability of performance.

Data for both case studies has been collected by the lead author through interviews with key personnel involved in contract management and through analysis of buyer and supplier documents. Semi-structured interviews have been used since some structuring of interviews improves accuracy as well as ease of data processing, but flexibility and latitude in interview topics is also needed (Bryman and Bell, 2007). This flexibility is

important in theory elaboration to capture insights that may be employed to introduce new concepts.

The interviews were held with employees in different positions of the buying and supplying organization to enable source triangulation (Yin, 2009). All interviews were held by the same researcher to ensure a consistent approach to data collection. An overview of the employees interviewed can be found in Table 3.1. Buyer and supplier documents (e.g., tender documents, the contract, and newsletters) were studied to enable further data triangulation.

Table 3.1
Overview of interviewees

	Case 1: train operator	Case 2: university hospital
Interviewees at buying organization	• Director of purchasing • Senior buyer • Senior contract manager • Contract manager • Senior auditor • Transition manager • Controller • Manager external cleaning	• Director of purchasing • Senior buyer • Director of facility services • Cluster manager of facility services • Regional manager of facility services
Interviewees at supplier	• Transition manager	• Director of joint venture • Joint venture manager

3.3.2 Data Analysis

Interviews were recorded, transcribed verbatim, and subsequently summarized. This process ensured a high degree of reliability and traceability of the data (McCutcheon and Meredith, 1993). The lead author coded the concepts and relationships between the concepts by employing a combination of open and closed coding. More specifically, sensitizing concepts were used to enable the coder to apply a structured coding approach yet leave room for the identification of additional constructs (Blumer, 1954; Van den Hoonaard, 1996). The concepts and sub-concepts shown in the coding scheme in Appendix B were derived from existing literature and used as sensitizing concepts. The application of sensitizing concepts was of importance since the identified concepts have not been previously studied in the context of performance-based contracting. Additional concepts were inductively derived.

To elaborate on existing theory, we moved iteratively between theory and practice (Orton, 1997; Dubois and Gadde, 2002). This enabled us to include disciplined imagination in our theory elaboration approach (Weick, 1989) and increased the likelihood of formulating accurate and reliable theory (Eisenhardt, 1989b). Appendix C lists the actions taken to validate the case study results.

3.4 CASE DESCRIPTION AND ANALYSES

3.4.1 Context Case 1: National Train Operator

The first case study concerns a performance-based contract used by a Western-European train operator to source interior cleaning of passenger

trains. With approximately 600 employees, the cleaning services provider cleans a total stock of about 2800 carriages and locomotives. The five-year performance-based contract was implemented in 2012 with pay linked to cleaning performance. The train operator aims to reduce costs while increasing performance, and stimulating innovation. At the time of implementation, the organization had limited to no experience with performance-based contracting.

Two types of cleaning operations can be distinguished in this case: cleaning operations at specific cleaning locations and cleaning operations at designated train stations. Most cleaning activities are carried out at cleaning locations during nighttime, when rolling stock is not in use. Cleaning at designated train stations is carried out during stops and focuses on contamination that is easy to clean (e.g., trash bins and newspapers).

The written contract is characterized by a combination of outcome and behavior clauses. These clauses are based on requirements set by the train operator during the tender as well as the cleaning concept proposed by the supplier. The main aims of the contract are to create a partnership and to shift responsibility for the outcome to the supplier.

The supplier is evaluated based on three Key Performance Indicators (KPIs): quality (cleanliness of trains), safety (processes and tools/materials used), and personnel (education provided and employee satisfaction). Bonuses and fines are tied to performance levels to incentivize the supplier to innovate, increase efficiency, and ultimately improve cleaning quality. The performance-based contract is managed by the buyer's department specialized in cleaning processes. A detailed specification of the bonuses and fines contained in the contract can be found in Appendix D.

3.4.2 Analysis Case 1: National Train Operator

Once the contract had been signed, the train operator (customer, which in our case is the buying organization) and supplier agreed on a division of operational tasks. The division of these tasks is identified next, to assess possible challenges concerning the attributability of the supplier's performance.

Supply chain roles and attributability of performance

Moving from a behavior or process-based contract to a performance-based contract should have caused a substantial change in roles assigned to the train operator. While previously a very active presence in directing the supplier was required, the supplier should now be given more freedom. “The supplier cleans trains all the time, so we assume that they are more knowledgeable about cleaning than we are. They need to come up with a way to clean the trains” (Buyer, Controller). A switch needs to be made from ‘design engineer’ to ‘quality assurance’. Moreover, the design of service production processes has to be left to the supplier so that it can utilize its ‘expert’ knowledge to improve existing processes. “We [as contract managers] need to have an informing and facilitating role” (Buyer, Contract manager).

In practice the train operator has, however, partly held on to the design engineer role as safety standards have been specified in the contract. Hereby, the supplier's freedom to design cleaning processes is limited. Freedom is limited further by the fact that the component and production manager roles have been assigned to the train operator. The component supplier role is especially predominant in this case as the trains need to be delivered to specific cleaning locations. The carriages and locomotives are

essential process components, without which cleaning processes cannot be carried out. “If you clean office buildings you know that the buildings will be in a specific location. Delivery of trains [to the cleaning locations], however, is associated with significant fluctuations. This can have a substantial impact on what you are able to clean” (Supplier, Transition manager). Delivery times of the trains thereby impact the production process. “If we deliver trains too late the supplier will have to deal with overcapacity [of cleaning personnel]” (Buyer, Transition manager). The train operator thus also assumes a ‘production manager’ role, as it determines the number of trains that are present at a specific time and place. As trains are idle at cleaning locations before and after they are cleaned, they are in ‘inventory’. The assignment of these roles to the buyer limits the supplier's freedom and thereby also the attributability of performance to the supplier's effort. Once cleaning activities have been carried out, quality needs to be assessed. This requires the train operator to assume the ‘quality assurance’ role. The ‘product’ role is not present in this case as the service provider does not act on the customer or the customer's organization.

The assignment of the design engineer, component supplier, and production manager roles to the buyer decreases outcome attributability to the supplier's inputs and effort. This is specifically challenging as actual supplier performance did not meet or exceed predefined targets. Moreover, the fact that the outcome is not entirely attributable to the supplier's inputs and effort has resulted in a strained buyer-supplier relationship as the supplier does not feel responsible for the inadequate performance.

Contract management activities

On a day-to-day basis the train operator engages in monitoring and coordinating activities that are of an operational nature. Enforcing and cooperating activities take place on a less regular basis as these are of a more strategic nature.

Monitoring

To monitor the supplier's performance, the train operator collects data related to three dimensions: safety, personnel, and quality. To monitor whether safety standards are met, the train operator's quality auditors carry out regular audits. Data is collected on the processes employed, use of tools and materials, use of protective clothing, and accessing of trains. Adherence to personnel standards (i.e. education) is monitored by administering employee surveys. Assessment of outcome quality (i.e. cleanliness of the trains) involves the most extensive monitoring activities, using three data sources: passenger satisfaction surveys, passenger as well as train conductor complaints, and quality audits. Reliability of customer surveys and complaints is limited due to a small sample size. More specifically, these data sources provide a general overview of customer satisfaction but cannot be linked to a specific cleaning location. More detailed data are required to provide the supplier with adequate feedback. Therefore, the train operator relies mainly on quality audits to monitor the supplier's performance. This type of data enables the buyer to provide detailed feedback on the supplier's performance at a specific location and time.

The quality audits are carried out by seven quality auditors using a quality measurement system designed specifically for this contract. The auditors carry out 62 audits per month, which equals about two audits per

cleaning location per month. To audit cleaning quality, auditors walk through the trains and register the number and type of remaining contaminations in the quality management system. These data are analyzed and subsequently used to provide feedback to the supplier. By engaging in such monitoring activities, the train operator aims to more readily distinguish whether the supplier's effort causes the performance outcome.

Enforcing

Once the supplier's performance on the specified KPIs has been determined, the train operator has to decide whether or not to enforce the contract. The contract is enforced by paying bonuses and/or levying fines. Bonuses are to be paid to the cleaning personnel, while fines are to be paid by the supplier.

During the first year the performance outcomes did not meet the specified targets. Nonetheless, the train operator decided to refrain from levying fines. This decision was motivated by the insight that levying fines this early in the relationship would negatively affect the relationship and future performance.

Coordinating

Due to the nature of this service, extensive coordination between buyer and supplier operations is required. "The efficiency that can be realized by the supplier is determined by our coordination efforts" (Buyer, Director of purchasing). Three main operations need to be coordinated by the buying organization: use of trains, maintenance, and cleaning. As the use of trains and maintenance activities take precedence over cleaning activities, coordination is essential. "We [the cleaning operations team] really have to fight for a position in the schedule" (Buyer, Manager of external cleaning). Internal coordination supports information flows between the train

scheduling department and contract managers, while external coordination supports information flows between buyer and supplier. Coordination enables contract managers to deliver accurate forecasts on the number of trains to be cleaned at a specific location. This in turn enables the supplier to adjust its cleaning capacity accordingly.

Accurate forecasting is typically hampered by two factors: disruptions in the train schedule and special events (e.g., national holidays, concerts, and promotions). Disruptions lead to delays and cause the actual number of trains in specific locations to deviate from forecasts. Events can increase the number of trains in use and cause more extensive contamination. Currently a diverse set of events is not coordinated within the buying organization. One example is a promotional event at train stations during which free product samples were handed out. Such events cause additional contamination since packaging ends up in trains (e.g., empty soda cans). By coordinating such promotional activities within the buying organization, contract managers gain access to more reliable information. This can subsequently be used to enable the supplier to adjust cleaning capacity in a timely manner. “Acting as an intermediary is what I believe to be most important” (Buyer, Contract manager). Engaging in coordination activities improves the information flows towards the supplier. This in turn enables the supplier to improve accuracy of cleaning capacity scheduling, which increases attributability of performance outcomes to the supplier's effort.

Cooperating

To facilitate cooperation through improved transparency and alignment of goals, strategic meetings between the buyer and supplier are organized once a week. “These meetings currently occur more often to alleviate the issues

that have arisen” (Buyer, Transition manager). The number of strategic meetings will be reduced to two a year once the most pressing strategic challenges have been addressed. Both organizations should have similar goals and act as a single organization: “To effectively coordinate [our operations] we need to act as one organization with a single goal. The main goal should be to deliver the agreed upon quality, which is a clean train for the customers. Money will then be a side issue” (Buyer, Senior buyer). “Cooperating is crucial. If we are not able to get the cooperation up and running, the two organizations will continue to operate as independent entities and issues will not be addressed” (Buyer, Transition manager). Engaging in cooperating activities thus aligns interests and thereby positively affects the relationship between buyer and supplier.

3.4.3 Context Case 2: University Hospital

The second case study concerns a performance-based contract for cleaning services used by a university hospital in the context of a joint venture. The hospital outsources only part of the cleaning activities: the hospital's cleaning staff cleans operation-critical spaces (e.g., operating theatres), while the cleaning services supplier's staff cleans less critical spaces (e.g., offices and restrooms). Both organizations combined employ 400 employees. In this case study the focus is solely on the outsourced cleaning activities. The supplier's cleaning staff of about 200 employees, which is employed by the joint venture, cleans a space of 175,000 m².

At the university hospital the majority of cleaning services are delivered during the evening. Cleaning operations do not interfere with the hospital's operations, as rooms to be cleaned are not in use during the night.

During the daytime some cleaning staff are on hand to respond to complaints and to clean restrooms.

The contract contains a large number of KPIs based on behavior and outcome specifications. These are used by the buyer's facility services (FS) department to evaluate the supplier's performance. Two main types of KPIs can be distinguished. Quality related KPIs evaluate the cleaning quality delivered by the supplier. KPIs related to the performance of the managing partner evaluate all activities carried out by the supplier to keep the joint venture running successfully (e.g., management of absenteeism). Based on the supplier's performance, bonuses will be paid, or fines will be levied. An overview of the bonuses and fines contained in the contract can be found in Appendix D.

3.4.4 Analysis Case 2: University Hospital

The joint venture (supplier) and FS department (buyer) have agreed on a specific task division to build towards a successful partnership. The supply chain role assignment associated with this task division will be identified next to establish whether challenges related to attributability of the performance to supplier's effort exist.

Supply chain roles and attributability of performance

As mentioned, the university hospital has set up a joint venture. “We have done this since we believed that the supplier's expertise could be combined with our own by acting as partners” (Buyer, Director of FS).

As the design engineer role has been assigned to the buying organization, it has defined cleaning protocols. These protocols are adopted by the supplier and adapted if needed. The design engineer role has

increasingly become more important as hospitals have had to deal with a growing number of infectious diseases (e.g., MRSA and Ebola). The creation of such protocols limits the supplier's possibilities to customize its services and causes a mismatch between customer demands and the work being carried out. "What happens here is that we clean everywhere in the same way. Some departments tell us that they would like us to clean only once per week, while other departments would like us to clean two, three or five times a week" (Supplier, Joint venture manager). Next to this, the creation of protocols limits creativity. "We of course [define protocols] to ensure patient safety but at the same time you take away all creativity and enthusiasm. And enthusiasm [from the cleaning personnel] is what in the end leads to productivity" (Supplier, Director of joint venture). The assignment of the design engineer role to the buyer hereby limits the attributability of performance to the supplier's efforts.

The 'production manager' role has been assigned to the buyer as well as the supplier. The buyer has created an overview of all rooms that need to be cleaned, which contains cleaning protocols to be used and the amount of time required to clean a room. The supplier subsequently plans and executes the production of the cleaning service. There is a caveat though: when supplier performance falls short and the buyer's contract manager is responsible for the outcome, the buyer's personnel becomes more directive and less collaborative. "In the end I am the one responsible for the outcome. This makes that you feel the urge to start directing [the operations], almost prescribing [the suppliers' personnel what to do]" (Buyer, Cluster manager of FS). This raises challenges related to attributability. The supplier's freedom to schedule service production is limited by the fact that the buyer

determines the time to be spent per room. More importantly, contract managers have adverse incentives that lead them to revert back to directing the cleaning personnel.

The ‘component supplier’ role has been assigned to the buyer as it provides buildings to be cleaned as essential process components. Related, the buyer performs the ‘inventory’ role as it provides a supply of rooms to be cleaned; mainly overnight, so there is no direct impact on the buyer's primary process. Once the service has been delivered, the buyer has to assess the quality. Therefore, the ‘quality assurance’ role has been assigned to the buyer. The ‘product’ role has not been assigned to the buyer.

As in the first case, the assignment of specific roles to the buyer decreases the outcome attributability to the supplier's inputs and effort. The negative effects become apparent at the individual level as cleaning personnel become frustrated by the fact that their performance evaluations do not match their effort. “This has a negative effect on our personnel's motivation” (Supplier, Joint venture manager).

Contract management activities

Also, in this case monitoring and coordinating are activities of an operational nature while enforcing and cooperating activities are of a more strategic nature. This is reflected in the frequency with which the university hospital engages in these activities. The hospital engages in operational activities on a daily basis while it engages in strategic activities on a monthly or even quarterly basis.

Monitoring

To assess performance based on the earlier discussed KPIs (quality and performance of the managing partner), the buying organization carries out

audits, administers customer satisfaction surveys, and monitors compliance with protocols. In contrast to the train operator, the university hospital utilizes all data sources to monitor the supplier's performance. Quality audits are carried out based on a nation-wide standardized auditing methodology for cleaning services. “Within the cleaning sector this is a nation-wide accepted methodology, which enables you to objectively measure quality” (Buyer, Regional manager of FS). While the auditors are employed by the hospital, they have no formal ties to the personnel that manages the contract. Customer satisfaction surveys are administered to assess whether employees and patients experience the hospital as clean. The reliability of this data collection method is, however, challenged by the supplier. “Employees could say: nice office but there is a hole in the wall ... and some other shortcomings. Not a neat office, 6 [out of 10, 10 being the highest]. But are the cleaning personnel responsible for damaged walls? No.” (Supplier, Joint venture manager). Yet, such additional data are valuable as auditors' measurement of cleanliness does not always match the perception of the ‘customers’. Finally, compliance with protocols is monitored to assess whether the joint venture has submitted all required reports.

By employing data from these three sources the university hospital is able to assess the supplier's performance based on multiple perspectives. In this way it can distinguish whether low levels of performance are caused by a lack of supplier inputs or effort. By engaging in these monitoring activities, attributability of performance can therefore be increased.

Enforcing

To stimulate performance, bonuses and fines were introduced. As in the first case, bonuses need to be paid out to the cleaning personnel individually, while fines are to be paid by the supplier.

Also, in this case, the buyer has decided not to enforce bonuses and fines during the first year, in response to the issues related to attributability and KPIs. “We said: Let's use the first year to build [the relationship] and let us not punish the supplier. That would be to nobody's benefit” (Buyer, Director of FS).

Coordinating

At the university hospital different aspects need to be coordinated when compared to the train operator. Yet, engaging in coordinating activities is just as crucial. “I think that the joint venture has underestimated the extent of coordination needed to keep all operational processes running. It is all about coordinating” (Buyer, Cluster manager of FS).

At the university hospital the contract managers have to act as a coordinating party between internal customers and the supplier. More specifically, contract management needs to communicate to the supplier changes in the rooms and areas that need to be cleaned. Such changes arise due to the repurposing of a room. However, this does not always happen in a timely manner. “At most businesses/organizations, you would get an overview of the rooms and areas about a month or month and a half before the changes are made. But here, I often get the overview with changes two months after the changes have been made. ... Better coordination would play a very important role in this” (Supplier, Joint venture manager). A lack of coordination thus decreases the attributability of performance as the supplier

does not always know which specific rooms or areas need to be cleaned. “All of a sudden we will get a complaint that we did not clean something while it has not even been entered into the system” (Supplier, Joint venture manager).

Customer requirements and complaints need to be coordinated with and communicated to the supplier. The buying organization attempts to fulfill customer demands through the design of cleaning protocols. In practice these cleaning protocols do not always match customer requirements and flexibility in the protocols is limited. Customers can make requests to get specific spaces cleaned that are not part of the cleaning schedule. The supplier's operational managers will then check whether this request can be honored within the allotted cleaning time. If cleaning capacity is exceeded the customer will have to pay for the additional cleaning operations.

Coordinating (changing) customer demands with the supplier is thus of importance to ensure that the supplier is able to meet customer demands. This is of specific importance in this case as the university hospital assumes the design engineer role by formulating cleaning protocols. By failing to engage in coordinating activities to keep the cleaning protocols aligned with customer requirements, the attributability of performance to the supplier's effort would be further decreased.

Cooperating

To increase transparency and align goals, the buyer and supplier organize strategic and tactical meetings. “Twice a year a shareholder meeting is held. ... In addition to this there are ... tactical meetings during which we discuss the main aspects of the contract” (Regional manager of FS). Alignment of goals through cooperating is of specific importance when a non-profit organization partners with a for-profit business. “Even though we have set

up a joint venture, we do notice that there is a business behind it that essentially has a single goal: making as much money as possible by doing as little as possible. So, we have opposite goals” (Buyer, Regional manager of FS). The hospital on the other hand has different goals. “My goal is to get as much cleanliness for the money that we spend” (Buyer, Regional manager of FS). This exact issue has in fact been one of the main motivations to implement a performance-based contract. Engaging in cooperating activities to build a partnership, even in the context of a joint venture, appears to be of importance to positively affect performance outcomes.

3.5 DISCUSSION

In this section, the two case analyses are compared, and findings are embedded in extant literature to formulate propositions as well as a conceptual model.

3.5.1 External Factors

As has been discussed in the literature section, previous research has focused on the effects of external factors on outcome uncertainty. While we have not focused on external factors in our study, these previous findings will be included in our conceptual model as a baseline proposition.

External factors (e.g., government policies, economic climate, competitor actions, technological changes) increase outcome uncertainty (Eisenhardt, 1989a; see also Celly and Frazier, 1996) and thereby negatively affect outcome attributability of performance to supplier effort. While our research did not focus on such external factors, both cases show how external factors impact attributability. In the case of cleaning services, the weather is

a context specific external factor that has a substantial impact on the relationship between supplier inputs as well as effort and performance.

Proposition 1. The greater the extent to which factors beyond the control of buyer or supplier affect service outcomes, the lower the outcome attributability of performance to supplier inputs and effort.

3.5.2 Supply Chain Roles and Outcome Attributability

In both cases, the buying organizations have switched from a behavior- to a performance-based contract to shift responsibility to the cleaning services supplier by linking pay to performance. In both cases, the relationship between buyer and supplier was set up as a partnership. While one might expect that the implementation of a performance-based contract would limit the extent to which supply chain roles are assigned to the buying organization, this is not the case at either organization. The design engineer, production manager, component supplier, inventory, and quality assurance roles have been assigned to both buying organizations to varying degrees. A summary of the main findings can be found in Table 3.2.

While the train operator has decreased its involvement in designing cleaning processes, the university hospital has not. Both buying organizations have assumed the design engineer role to minimize risk exposure. The train operator has designed safety standards and prescribes periodic cleaning activities to be carried out by the supplier, as this reduces the exposure to risk associated with accidents and warranty claims respectively.

Table 3.2

Supply chain roles findings (TO = train operator; UH = university hospital)

	Design engineer	Production manager	Component supplier	Inventory	Quality assurance
Extent of role assignment to buyer	TO: moderate	TO: extensive	TO: extensive	TO: moderate	TO: moderate
	UH: extensive	UH: moderate	UH: limited	UH: limited	UH: moderate
Type of input	Information	Information	Physical objects	Physical objects	Information
Affects attributability	Yes	Yes	Yes	No	No

The design of the regular cleaning process is left to the supplier. In contrast, the university hospital has designed cleaning protocols for all cleaning activities carried out by the supplier, to decrease the exposure to an increasing number of infectious diseases.

In practice, many performance-based contracts contain combinations of behavior, process, and outcome specifications (Martin, 2007; Selviaridis and Wynstra, 2015; Sols and Johannesen, 2013). As such, the process specifications provided by the two buying organizations from our case studies are no exception. It is at the same time clear, however, that a detailed execution and broad scope of the design engineer role will grant the supplier less autonomy, and possibly will decrease its motivation to pursue improvements (Sumo et al., 2016; Wynstra, 2015). This is particularly the case at the university hospital.

While the train operator and the university hospital do not direct the service production in detail, they do impact the planning of production and thereby take an active role as production manager. The train operator

determines the time at which a train can be cleaned by its train delivery schedule. The hospital on the other hand affects the planning of service production by deciding and communicating which rooms/ areas need to be cleaned, and when. Our case studies illustrate in this respect that “the quality of many business services depends not only upon the performance of the supplier but also on how well the customer performs in *interaction* with the supplier” (O'Farrell and Moffat, 1991, p.206; emphasis in original).

The assignment of the component supplier role to the buying organizations is crucial in both cases as the supplier needs access to an essential process component (trains or buildings). The train operator needs to deliver the trains to specific cleaning locations to provide the supplier access to the trains. The supplier is thus very dependent on this buyer input in being able to carry out its cleaning processes. The university hospital on the other hand only needs to grant the supplier access to the objects (buildings, rooms) to be cleaned. The buyer inputs associated with the component supplier role thus vary based on the service context. In contexts in which the supplier is dependent on the buyer to deliver objects to be cleaned, this dependence can negatively affect supplier performance and hence supplier payment: performance is then no longer fully attributable to the supplier (Else et al., 1992; Selviaridis and Wynstra, 2015).

In the case of train cleaning, the inventory role is also performed by the buying organization, closely intertwined with its role of component supplier. Basically, an inventory of trains or rooms to be cleaned can help the supplier to improve capacity utilization (Sampson and Spring, 2012), and that is one of the reasons why most cleaning is done overnight, when trains and rooms are not (all) in service and the customer (and its clients, i.e.

passengers, patients) do not have to be waiting for the service, if all goes well.

Both buying organizations have assumed the quality assurance role to ensure that the supplier meets quality targets. The assignment of the inventory and quality assurance roles to the buying organization does not affect the outcome attributability of performance to supplier effort. These findings are captured in the following proposition.

Proposition 2. The greater the extent to which the buyer assumes the design engineer, production manager, and component supplier roles, the lower the outcome attributability of performance to supplier inputs and effort.

Both cases illustrate that a limited level of outcome attributability of performance to supplier inputs and effort results in frustrated suppliers and a strained relationship. Social psychologists have long recognized the importance of causal attribution in determining behavior (Duval, Duval, and Mayer, 2014). According to Kelley (1973) “causal attribution identifies the causes of certain effects and forms the basis for decisions about how to act in order to bring about the continuance or discontinuance of those effects” (p. 127). In cases of service outsourcing, suppliers, and more specifically their employees, will thus alter their behavior based on the perception of outcome attributability to their inputs and effort. If outcome attributability is limited, the supplier and its cleaning personnel will not be motivated to deliver the required inputs and put in the required effort to meet or exceed the agreed upon level of performance outcomes.

Proposition 3. The lower the outcome attributability of performance to supplier inputs and effort, the lower the level of supplier inputs and effort.

3.5.3 Contract Management Activities

Both buying organizations engage in three of the four contract management activities that emerge from the literature review: monitoring, coordinating, and cooperating. A summary of the main findings can be found in Table 3.3.

Table 3.3

Contract management activities findings

	Monitoring	Coordinating	Enforcing	Cooperating
Engagement in activity	TO: moderate UH: moderate	TO: extensive UH: moderate	TO; no UH: no	TO: moderate UH: moderate
Nature of activity	Operational	Operational	Strategic	Strategic

Both organizations had to switch to monitoring outcome quality instead of behavior. While the university hospital had previously monitored outcome quality to a limited extent, the train operator had only monitored behavior. To increase attributability of performance to supplier effort and thereby minimize discussion concerning whether compensation is adequate, both organizations monitor outcome through the use of standardized quality audits. Yet, measurement systems remain a simple model of a complex business reality (Franceschini, Galetto, and Maisano, 2007). Therefore, both organizations complement quality audits with customer satisfaction surveys and complaints registrations. These monitoring activities, including the

feedback discussions with the supplier, enable the buyer to separate attributable outcomes from non-attributable outcomes, even in situations in which the extent to which the buyer has assumed specific supply chain roles is extensive. Hence, monitoring moderates the negative effect of supply chain roles having been assigned to the buyer on attributability.

By engaging in coordination activities both buyers provide the supplier with information concerning the number of objects to be cleaned at a certain time and place. This type of information is of particular importance in the first case due the nature of the case context. As disruptions can cause a change in the number of trains to be cleaned at specific locations and times, continuous information exchange is essential. At the university hospital changes in the number of rooms are less prevalent. Information exchange between buyer and supplier does therefore take place less often and in a more standardized manner. These differences in coordination modes can be explained by the uncertainty and interdependence of the task (Thompson, 1967; Van de Ven, Delbecq, and Koenig, 1976). At the train operator the degree of work flow interdependence is quite extensive as service delivery is of a reciprocal nature. Therefore, a coordination mode that is less programmed and relies on feedback and mutual adjustment is suitable. At the university hospital there is less task uncertainty and interdependence as service delivery is of a sequential nature. Consequently, a more programmed approach to coordination is suitable, based on pre-established plans, schedules, forecasts, formalized rules, policies and procedures, and standardized information and communication systems.

Both organizations need not only engage in external coordination (between buyer and supplier) but also in internal coordination. Coordination

between the contract management and train scheduling departments enables the train operator to provide the supplier with accurate forecasts on the number of trains to be cleaned. In the second case, coordination between the contract management department and the customers enables the hospital to provide accurate information on customer demands. Internal coordination is in both cases thus imperative to external coordination. Both types of coordination together, if done well, enable the supplier to perform better with appropriate effort, and therefore mitigate the impact of the design engineer, production manager, and component supplier roles having been assigned to the buyer on attributability.

Proposition 4. A buyer's effective engagement in monitoring and coordinating activities moderates the relationship between the extent to which the buyer assumes the design engineer, production manager, and component supplier roles and outcome attributability of performance to supplier inputs and effort, such that this negative relationship is attenuated.

The train operator as well as the hospital aim to enforce the contract by paying bonuses or levying fines based on multiple KPIs. As several challenges have arisen both organizations have chosen to not enforce the contract initially but rather discuss and interpret challenges together with the supplier. Hereby the contract and performance measurement are used in a more open and relational matter rather than instruments for static control (Enquist, Camén, and Johnson, 2011).

Cooperating is a prerequisite for coordinating (Beer, Eisenstat and Spector, 1990). To stimulate cooperation, both organizations organize strategic meetings to increase transparency and align goals. Ang, Groosman, and Scholten (2005) in fact identify transparent cooperation as a determinant of performance-based project success. Cooperating is linked to enforcing, as the enforcement of performance targets can lead to subsequent adjustments in the information exchange. Goal alignment is facilitated by engaging in enforcing activities. As both organizations have chosen not to enforce the contract during the first year, goal alignment is not in place. This results in challenges and frustrations as the supplier continues to focus on cost whereas the buyer continues to focus on quality. Cooperation appears to be an antecedent that affects the buyer-supplier relationship and thereby the willingness to engage in coordination activities. From our data it does not become clear, however, how this affects the relationships in our conceptual model. Therefore, a proposition cannot be formulated based on the available evidence.

Neither organization has engaged in enforcing activities during the first year of contract execution. As we have not been to collect data on the engagement in enforcing activities, a proposition cannot be formulated. It is clear, however, that enforcing activities play an important role in structuring the relationship and might thereby act as an antecedent.

3.5.4 Conceptual Model

The discussed findings illustrate that challenges that occur during contract execution in situations of low outcome attributability in the service exchange requires buying organizations to engage in distinct contract management

activities. The relationships between the discussed concepts are visualized in Figure 3.1. Given the absence of the labor and product roles in the two cases, our elaborated conceptual model relates to the design engineer, production manager, and component supplier supply chain roles. The inventory and quality assurance roles were found not to affect attributability and are therefore not included in the model. The cooperating activity appears to be an antecedent and can at this point not be put into the model. Also, as we have not been able to collect clear evidence on the engagement in enforcing activity, it is not included in the model. The conceptual model proposes that performance-based contracts can also be effectively implemented in situations where performance depends heavily on the buyer inputs associated with specific supply chain roles. Contract management activities help to increase attributability in such situations and help to keep suppliers committed as well as engaged even when attributability is relatively low.

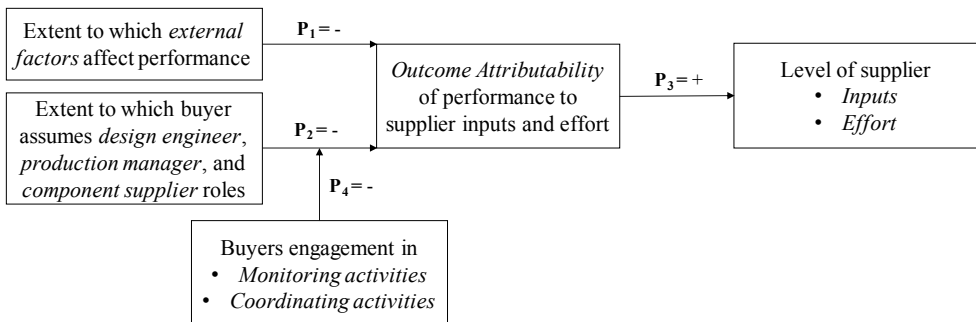


Fig. 3.1. Conceptual model

3.6 Conclusions

3.6.1 Theoretical Contributions

Performance-based contracting aims to manage suppliers based on outcome (not process), put them in their expert role, and shift responsibility to the supplier by providing it with more freedom to decide how to deliver the desired performance. While this may suggest that a *laissez-faire* style of contract management suffices, our study shows that customers assume more roles than simply monitoring suppliers' performances and rewarding accordingly. As part of the service exchange, customers design service production processes or affect the design thereof, (help to) plan service production, provide access to crucial components (and create an inventory of such components where needed), and assure that the agreed upon performance is delivered. The customer inputs associated with these roles co-determine the supplier's performance, and in this way, they decrease the attributability of the service outcomes to just the efforts of the supplier.

While outcome uncertainty (i.e. decreased attributability) has been studied in relation to the effectiveness of performance-based contracting, it has been mainly defined in terms of sources in the external environment. By integrating service operations management theory, our model identifies specific sources—particular roles of the customer in service design and delivery—of customer-induced outcome uncertainty.

For a performance-based contract to work effectively in such situations of increased outcome uncertainty, active engagement of the customer in contract management is required.

Contract management activities related to monitoring and coordinating help to ensure that the customer understands which performance outcomes are attributable to the supplier, and that the supplier is not hindered in achieving performance outcomes due to untimely or inadequate customer inputs.

In sum, this study systematically links supplier engagement, in terms of inputs and efforts, to outcome attributability, and outcome attributability to situational factors as well as buyer behaviors. This study proposes how contract management contributes to the success of performance-based contracts, through the mediating concept of outcome attributability. Outcome attributability is posited as a pivotal concept in explaining the success of performance-based contracting. The proposed framework represents actionable theory, as it stipulates how buyer roles on the one hand decrease attributability of performance outcomes to suppliers, but also how contract management activities of the buyer help to attenuate such negative effects.

3.6.2 Managerial Contributions

This study provides managers of buying organizations with some initial insights concerning the management of a performance-based contract. More specifically, it provides managers with insights into how and why contract management activities help to keep suppliers engaged when a performance-based contract is used in a service exchange. It may seem that performance-based contracts require an arm's length relationship with the supplier. Our study shows that on the one hand, contract managers need to learn to 'let go' and give the supplier room to take its expert role. On the other hand, contract managers need to remain engaged and in touch, in order to facilitate the

supplier. The supplier depends in various ways on the buying organization in order to perform. Adequate training of the contract management staff is needed to facilitate a smooth transitioning into their new roles. In our two case studies we saw that the contract management responsibility does not rest just with the purchasing department, but wholly or partly with operational departments, such as facility management.

From this study, managers can also gain insights concerning the link between contract design and contract management. Managers should be aware that shortcomings in the written contract could cause challenges while managing the contract. In the two studied organizations personnel not involved in contract management have designed the contracts. It appears that involving personnel with contract management experience in the design of the contract could have minimized the shortcomings in the written contract (e.g., inclusion of realistic performance targets). This in turn would reduce the number of challenges faced in managing a performance-based contract.

3.6.3 Limitations and Future Research

There are four main limitations to this research. First, our specific sample of cases means that the results, i.e. the conceptual model developed, may not fully generalize to other contexts, regarding three dimensions. First, our studies focus solely on cleaning services and service characteristics specific to cleaning services might limit the generalizability to other service types. Our cases were selected to display variety in customer roles, and keeping the service type constant may rule out some alternative explanations for differences in performance attributability. It is likely that with other types of

services, the customer needs to fulfill supply chain roles in other ways and to differing extents.

Secondly, the case studies were carried out in one country. This country is generally characterized by a culture based on deliberation and reaching consensus, which could be conducive to the creation of partnerships with suppliers. In countries with more hierarchical cultures and greater power distance, partnerships may be more difficult to create. This could cause the buyer to assume a different set of roles and activities and engage in less coordination and cooperation with the supplier.

Thirdly, both cases concern organizations with a rather strong public management background. The university hospital is a public entity and the train operator is a former public organization. What is particularly salient, in our view, is that both organizations operate under a strong eye of the public. Nevertheless, we expect to see similar levels of importance in other service organizations with intensively used spaces such as banks, retail outlets, and universities.

The fourth limitation refers to the data collection. We predominantly interviewed personnel at the buyer side, and the limited number of interviews with supplier's employees could be seen as a limitation. As we study contract management practices of the buying organization, the focus on the buyer's perspective is however warranted.

Based on our research we can suggest two main directions for further research. First, the conceptual model developed in this paper needs to be elaborated further and tested, for other types of services and in other sectors and cultures. In doing so, one activity to investigate more closely is contract enforcement.

Second, some interviewees indicated that performance-based contracting requires contract management personnel to develop other skills than are required for behavior-based contracting. Future research could study which skills are required at the individual level to be able to manage a performance-based contract successfully.

CHAPTER 4

Uncovering Behavioral Effects of Causal Attributions and Attributional Biases in Performance-based Contracting

4.1 INTRODUCTION

Well known for its early use by the US army to incentivize suppliers to deliver innovative maintenance services, performance-based contracting (PBC) is now widely used across public and private sector to improve supplier performance (Hypko, Tilebein, and Gleich, 2010). While the incentive mechanisms underlying PBC have been shown to significantly improve supplier performance (Guajardo et al., 2012), unsuccessful implementations continue to be documented in the academic literature (e.g., Banker et al., 1996; Ng and Nudurupati, 2010; Ssengooba, McPake, and Palmer, 2012). Determinants of PBC effectiveness have therefore received renewed attention from practitioners and academics (Nullmeier, Wynstra, and Van Raaij, 2016; Steinbach, Wallenburg, and Selviaridis, 2018).

Recognizing that PBC is predicated on agency assumptions (Fong and Tosi, 2007; Jensen, 1989), contracting scholars have relied on agency theory (Jensen and Meckling, 1976) to provide supply chain managers with guidance on how to use PBC effectively (Selviaridis and Wynstra, 2015). Agency theory is relevant to inter-organizational contractual relationships since it is concerned with problems that can arise when buyers contract suppliers to make decisions on their behalf (Fama and Jensen, 1983). These agency problems manifest themselves as suppliers engaging in opportunistic behavior as they have different goals from buyers (Eisenhardt, 1989a).

Previous studies have advocated the use of contractual incentives underlying PBC to foster goal alignment between a supplier and a buyer (Kim, Cohen, and Netessine, 2007). However, these contractual incentives are said to be less effective when suppliers are risk-averse, contractual outcomes are difficult to measure, and when outcome uncertainty arises as contractual outcomes are not (entirely) controllable by suppliers (Zu and Kaynak, 2012). Outcome uncertainty has become a central topic in the contracting literature due to its close association with the supplier's propensity to accept the risks that are inherent to PBC (Selviaridis and Norrman, 2014). To increase our understanding of the manner in which outcome uncertainty decreases the effectiveness of PBC, recent studies have looked at how environmental factors (e.g., regulations and economic climate) and non-collaborative buyer actions can cause the achievement of outcomes to be uncertain (Ng, Maull, and Yip, 2009; Nullmeier et al., 2016; Steinback et al., 2018). Being grounded in agency theory, contracting literature suggests that uncertainty introduced by these factors create disutility of effort, which drives suppliers to act opportunistically (Nullmeier et al., 2016). Consequently, PBC is suggested to be less effective in contracting outcomes that are determined, at least in part, by environmental factors and non-collaborative buyer actions.

These insights are, however, based on the assumption that managers are rational decision makers who are unaffected by emotions and cognitive biases (Bendoly, Donohue, and Schultz, 2006; Katsikopoulos and Gigerenzer, 2013). Scholars have criticized findings grounded in the assumption of bounded rationality, as such findings ignore the motivational implications of emotions and cognitive biases (Loch and Wu, 2007; Long and Sitkin, 2018). If previous studies have indeed ignored the role that

emotions and cognitive biases play in contractual relationships, it could have led to inadequate conclusions concerning the effectiveness of PBC in specific contractual settings. Having faced similar criticism, supply chain scholars have drawn on attribution theory (Weiner, 1986) to study how emotions and cognitive biases affect supplier behavior (e.g., Gino and Pisano, 2008; Mir, Aloysius, and Eckerd, 2017; Ro, Su, and Chen, 2016). Building on these insights, we use attribution theory to study how supplier behavior is affected by the attributional processes used by managers when assigning responsibility for contractual outcomes (Fiske and Taylor, 1991). To gain a better understanding of how managers assign responsibility when environmental factors and non-collaborative buyer actions affect contractual outcomes, we first conduct an exploratory case study. We then complement this case study with an experiment to test our theoretical predictions concerning the psychological effects of PBC.

With this study we seek to make two conceptual contributions and one methodological contribution to the behavioral supply management and contracting literature. First, we study how emotions experienced by suppliers' managers affect the ability of PBC to govern supplier behavior. Previous studies have assumed that organizational responses to contractual incentives are driven by (bounded) rationality and have therefore not considered the role of emotions experienced by individuals. We break with this convention to uncover whether emotions affect how suppliers respond to contractual incentives. Second, we study the extent to which PBC effectiveness in motivating suppliers is constrained by attributional biases. While it is assumed in contracting literature that suppliers will all respond to contractual incentives in the same way, we study how attributional biases can

in fact cause them to respond differently. Third, we extend the attribution styles concept beyond the intra-organizational context by testing its relevance in the inter-organizational context. Moreover, we test whether the concept covers biases on all causal dimensions that affect achievement motivation in inter-organizational settings.

The remainder of this paper is structured as follows. In section 2 we discuss the theoretical insights attribution theory that inform this study. Because attribution theory has not been used to study PBC, section 3 reports on the results of an exploratory case study undertaken to provide preliminary insights on how emotions can affect PBC effectiveness. In section 4 we formulate our research hypotheses based on the insights gained from the exploratory case study and extant literature. In section 5 we report on the results of a scenario-based experiment used to test our hypotheses. Finally, in section 6 we highlight the implications of our study for theory and practice, and discuss its limitations and directions for future research.

4.2 LITERATURE REVIEW

4.2.1 Psychological Effects of Performance-based Contracts

Although contracting literature provides us with a detailed understanding of the manner in which PBC can be used to mitigate opportunistic behavior (see Selviaridis and Wynstra, 2015 for a review), we know little about the psychological mechanisms that drive behavior in response to PBC. Seeking to further our understanding of psychological effects of contracts, Weber and Mayer (2011) studied how *contract framing* influences emotions and behaviors. These scholars argue that promotion framed contracts, which are based on gain framing, induce low-intensity feelings of sadness since failing

to reach a maximum target is seen as falling short of an ideal, not as a failure. On the other hand, prevention framed contracts, which are based on loss framing, are said to induce high-intensity agitation since one fell short of achieving a minimum target. Both types of contract framing are thus said to induce negative emotions when managers are confronted with failures (Weber, Mayer, and Macher, 2011).

A recent study finds that performance-based contracts can be framed using promotion, prevention and hybrid frames (Selviaridis and Van der Valk, 2018). Following Weber and Mayer's (2011) reasoning, PBC should thus induce low- to high-intensity *negative* emotions, when managers are confronted with failures to achieve contractual outcomes. What has, however, been neglected by Weber and colleagues are the psychological effects of factors that cause such failures to arise. Based on attribution theory, Weiner (1986) argues that *causes* of failures rather than the failure itself determine whether positive or negative emotions are experienced by managers.

4.2.2 Attribution Theory

Attribution theory (Weiner, 1986) explains the cognitive processes through which managers assign responsibility for their success or failure to achieve outcomes (Fisher and Taylor, 1991). The premise being that managers have an innate desire to understand the causes of important outcomes and that their attributions influence their expectancies, emotions and future behavior (Heider, 1958; Martinko, Harvey, and Douglas, 2007a). Wong and Weiner (1981) suggest that managers spontaneously engage in attributional activities referred to as *causal search* to assign responsibility for outcomes. Causal

search is said to be a three-step cognitive process leading to causal attributions (see Figure 4.1): First, managers determine the source of a cause (internal vs. external), which has been termed the *locus of causality*. Second, managers assess whether the cause is of a persistent or temporary nature, which has been termed *stability* (stable vs. unstable). Third, managers determine whether the cause is under the volition of an individual, which has been termed *controllability* (controllable vs. uncontrollable). Recent studies have further specified the controllability dimension by distinguishing between *self-controllability* and *other-controllability* (Gurevich, Klinger, and Weiner, 2012; Weiner, 2018). Self-controllability refers to the degree to which managers perceive the cause to be something which they themselves can control (controllable vs. uncontrollable by self). Other-controllability assesses the degree to which managers perceive the cause to be under the volition of others within or outside of their organization (controllable vs. uncontrollable by other).

In the context of buyer–supplier contractual relationships, locus of causality refers to whether suppliers’ managers perceive an outcome to be caused by their own actions (internal) or by the actions of employees of another organization (external) (Mir et al., 2016). Stability refers to whether suppliers’ managers perceive a cause to affect contractual outcomes across periods (stable) or only in the previous period (unstable). Self-controllability refers to whether suppliers’ managers perceive a cause to be under the control of the suppliers’ employees (controllable by self) or not under the control of the suppliers’ employees (uncontrollable by self). Other-controllability refers to whether suppliers’ managers perceive a cause to be under the control of

buyers' employees (controllable by other) or not under the control of buyers' employees (uncontrollable by other).

The causal search process is of interest to this study since combinations of causal dimensions are said to trigger specific emotions, which in turn affect achievement motivation of suppliers' managers (see Figure 4.1.) (Weiner, 2018). Table 4.1 provides an overview of all causal dimension – emotion links that have been empirically tested. The emotions that are experienced by suppliers' managers determine to which extent they will be motivated to achieve contractual outcomes in the subsequent period.

Table 4.1 Causal Dimensions – Emotion Links

Outcome	Essential causal dimensions	Emotion
Success	Locus: internal	Pride
Success	Locus: external, Other-controllability: controllable	Gratitude
Failure	Stability: stable	Hopeless
Failure	Stability: unstable	Hope
Failure	Locus: internal, Self-controllability: controllable	Guilt and regret
Failure	Locus: external, Other-controllability: controllable	Anger
Failure	Other-controllability: uncontrollable	Sympathy

4.2.3 Attributional Biases

Although attribution theory provides us with a clear framework to determine psychological effects of factors that cause performance shortfalls, it is important to recognize that the causal search process is said to be influenced by attribution styles of managers (Abrahamson, Seligman, and Teasdale,

1978; Kent and Martinko, 1995a; Russell, 1991). Attribution styles are trait-like characteristics that lead to specific tendencies, which result in the making of similar attributions across different types of outcomes (Martinko et al., 2007b). Attribution styles have been found to be useful in predicting both attributions and behavior since attribution styles affect attributions, which in turn affect behavior (see Martinko, Douglas, and Harvey, 2006 for a review).

Extant literature has made a distinction between *intrapersonal* and *social* attribution styles (Martinko, Sikora, and Harvey, 2012). Intrapersonal attribution styles are concerned with managers' causal attributions for their own outcomes, whereas social attribution styles describe how managers attribute the causes of other people's outcomes. In this study we focus on intrapersonal attribution styles as our study is concerned with suppliers' managers' causal attributions for contractual outcomes to be delivered by the supplier. The most studied intrapersonal attribution styles are *optimistic* and *pessimistic* attribution styles (Abramson, Seligman, and Teasdale, 1978; Douglas and Martinko, 2001). According to this dichotomy, managers with optimistic styles are biased toward making 'internal, stable and controllable' attributions for success and 'external, unstable and uncontrollable' attributions for failure. That is, managers with this self-serving attribution style attribute successes to themselves and failure to others (Harvey and Martinko, 2010). They therefore often feel good about themselves and their capacity for success. In contrast, managers with a pessimistic attribution style tend to make 'external, unstable and uncontrollable' attributions for success and 'internal, stable and controllable' attributions for failure. They often lack confidence in themselves and are pessimistic concerning their chances for success. Therefore, attribution styles affect the outcome of the causal search

process (see Figure 4.1). We posit that these individual differences between managers make suppliers respond in a different manner when confronted with the same negative outcomes.

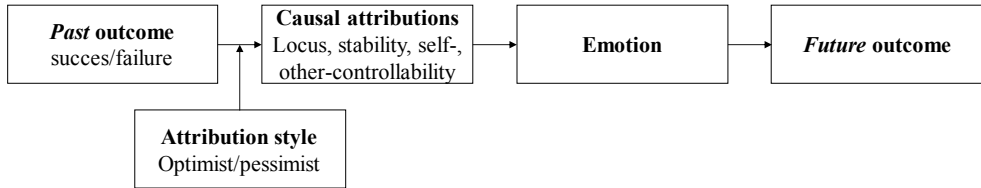


Fig. 4.1. Attributional processes

4.3 EXPLORATORY CASE STUDY

We conducted an exploratory case study to gain a better understanding of the role that causal attributions play in inter-organizational contractual relationships. Insights gained are subsequently used to formulate hypotheses to be tested in a scenario-based experiment.

4.3.1 Case Description

To gain a better understanding of the way in which suppliers' managers assign responsibility for environmental factors and non-collaborative buyer actions, we studied how a train operator fared when using PBC over a six-year period (2012–2017). By using PBC, the train operator sought to incentivize a cleaning services supplier to improve the quality of cleaning provided. Cleaning performance under a previous contract had been unsatisfactory and decreased passengers' satisfaction with the overall service offering of the train operator. Therefore, a six-year performance-based contract was implemented, designed to improve cleanliness of the trains and passenger satisfaction.

The performance-based contract contained both positive and negative incentives. Bonus payments were applied at the individual level to reward cleaning staff for achieving specified performance outcomes. Fines were applied at the organizational level to punish the cleaning services supplier for not achieving the specified performance outcomes. More specifically, a fine was deducted from the service fee paid to the supplier if performance outcomes were not achieved. Performance outcomes had been specified in relation to adhering to safety standards, providing adequate training/education to cleaning staff, and meeting cleanliness targets. While safety and education targets had been met consistently since 2012, cleanliness targets had not. We therefore focus on the performance outcomes concerning the cleaning performance of the supplier as experienced by passengers.

4.3.2 Data Collection and Analysis

Data were collected by the lead author through two rounds of interviews with key staff of the buyer and supplier. In the first round, in 2013, interviews were held with eight employees of the buyer who were involved in designing and managing the contract, one employee of the supplier who was involved in managing the contract, and four members of the cleaning staff. From this round of interviews, we identified environmental factors and non-collaborative buyer actions that caused variations in outcomes that could not be controlled by the supplier. In the second round of interviews in 2018, interviews were held with five employees of the buyer who were involved in designing and managing the contract and two cleaning staff. During the second round of interviews we adopted a retrospective perspective to

establish whether the environmental factors and non-collaborative buyer actions we had identified had triggered emotions in employees of the supplier and affected supplier performance. Interviews were held with employees in different positions to enable source triangulation (Yin, 2009). Internal documentation (e.g., contract and newsletters), monthly passenger satisfaction data from January 2002 to February 2018, and news articles from external sources were collected to enable further triangulation of the data.

Once the data collection had been completed, we analyzed the passenger data to identify any distinct phases where there were noticeable changes in satisfaction levels. We then analyzed qualitative data from our transcribed interviews, internal documents, and news articles to establish how causes of outcome uncertainty affected supplier performance. Reliability and traceability of qualitative data was ensured by using closed coding (McCutcheon and Meredith, 1993; Yin, 2009).

4.3.3 Case Analysis and Results

Having implemented PBC in 2012, the train operator's management team soon experienced disappointing results. "We implemented contractual incentives to motivate the supplier to improve [cleaning] performance but the [achieved] outcomes did not meet our expectations" (Train operator, director of supply chain operations, 2018). During our discussions with the train operator and its supplier in 2013, two main causes of the unsatisfactory contractual outcomes were highlighted: changing weather conditions (environmental factor) and inconsistent delivery of trains to cleaning locations (non-collaborative buyer action). Both factors required the cleaning services operator to adjust its cleaning capacity (i.e., the number of cleaning

personnel) in order to deal with fluctuating capacity demands. More specifically, poor weather conditions make trains grimmer, which means that additional cleaning capacity is needed to remove sand, sludge, and similar contaminants during periods of poor weather. “Weather is an important factor. Especially during the winter, weather conditions affect cleanliness in a negative manner” (Train operator, manager of external cleaning, 2013). While weather conditions are fairly predictable because of the availability of weather forecasts, inconsistent delivery of trains to cleaning locations created a more significant challenge for the supplier. To enable the supplier to clean its trains, the train operator had to take the trains out of service and deliver them to one of several cleaning locations throughout the country. To facilitate capacity planning, the train operator and the supplier had agreed on a delivery schedule that detailed the number of trains to be delivered to a specific cleaning location. However, when there were unexpected disruptions due to breakdowns in the rail infrastructure, for example, the train operator seldom adhered to the agreed schedule. Consequently, the cleaning services supplier frequently had to deal with a mismatch of cleaning capacity at cleaning locations throughout the country. “If you clean office buildings you know that the buildings will be in a specific location. Delivery of trains [to the cleaning locations], however, is associated with significant fluctuations. This can have a substantial impact on what you are able to clean” (Supplier, Transition manager, 2013).

When we look back over the six-year period of the contract, distinct developments in the identified factors and resulting trends in passenger satisfaction become apparent. These developments can be divided into three two-year phases, as shown in Figure 4.2.

Phase 1: Suspension of contractual incentives

After a complex tender phase, a suitable supplier was selected, and considerable effort was invested in forming a buyer–supplier relationship based on partnership. However, both parties soon found that performance on the specified cleanliness targets was disappointing. As agreed in the contract, the train operator was in a position to levy a fine to punish the supplier for substandard performance. Having discussed the performance shortfalls at length, the train operator decided to suspend the contractual incentives during the first two years (2012–2013).

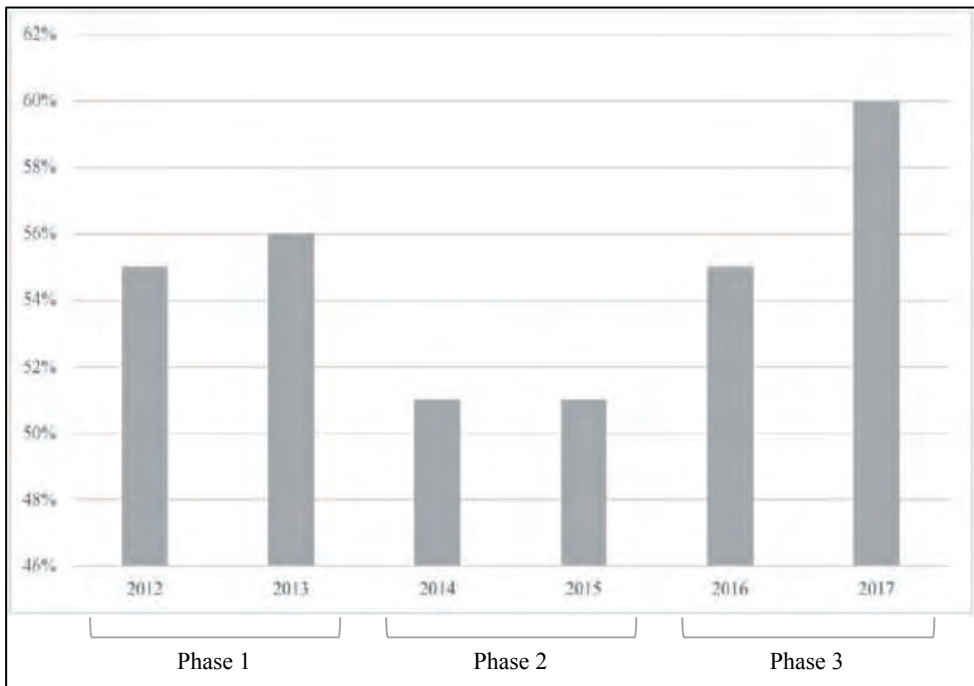


Fig. 4.2. Percentage of Passengers Satisfied with Cleanliness

“Our goal was to build a partnership with the cleaning services supplier, so we decided not to fine them [during the first two years]” (Train

operator, manager cleaning and maintenance, 2013). While it had become clear to both parties that the desired performance could only be achieved if coordination between them was improved, few operational improvements were made during the first two years. Consequently, passenger satisfaction increased only marginally during those two years. At the same time, changing weather conditions seemed to have no distinct negative effects on performance. “While weather is mentioned throughout the organization as an important factor, we find no evidence based on our passenger satisfaction data that it affects outcomes” (Train operator, head of passenger satisfaction department, 2013).

Phase 2: Reinstatement of contractual incentives

Having given the cleaning services supplier a considerable period of time in which to improve cleaning performance, the train operator reinstated the contractual incentives in 2014. During the following two years, the relationship between the train operator and the supplier worsened considerably. The supplier felt that it was being treated unfairly since it was made financially responsible for performance shortfalls caused by the train operator’s actions. That is, outcomes were affected by a cause that was under the buyer’s control: “This triggered [negative] emotions in both parties involved” (Train operator, director of supply chain operations, 2018). These negative emotions appear to have had a considerable effect on performance since passenger satisfaction levels decreased from 56 percent in 2013 to 51 percent in 2014. On the other hand, the effects of changing weather conditions could be blamed on neither party and did therefore not appear to result in negative performance outcomes.

Phase 3: Reduction of non-collaborative buyer actions

A newly appointed director of supply chain operations at the train operator recognized that the operator was partly to blame for the performance shortfalls and sought to remedy this. “We [the train operator] played an important role in this as we did not support them [the supplier] properly” (Train operator, director of supply chain operations, 2018). As a result of the change of leadership, operational changes were made to improve coordination with the supplier and on-time delivery of trains. Coordination with the supplier was improved by providing it with real-time data concerning day-to-day variations in the number of trains that had to be cleaned. To improve on-time delivery of trains, cleaning operations were given higher priority by the train operator managers. These collaborative buyer actions and resulting changes enabled the supplier to schedule its cleaning capacity more accurately and gave it more time to clean individual trains. Most importantly, the relationship between the train operator and the supplier was now based on the envisioned partnership, rather than on interactions in which both parties blamed each other. As can be seen in Figure 4.2, these changes appear to have had a significant positive effect on passenger satisfaction. On the other hand, changing weather conditions appear to have had no discernable negative effect on passenger satisfaction.

4.3.4 Preliminary Findings

The developments in our case study suggest that emotions triggered by non-collaborative buyer actions cause performance shortfalls to arise whereas emotions triggered by environmental factors do not. To gain a better understanding of the causal search process that lead to these different effects,

we classify these factors along the causal dimensions listed in Table 4.2. We conclude that it is the difference in causal placement on the other-controllability dimension that results in different behavioral effects.

Table 4.2

Causal placement of causes of performance shortfalls

Cause	Locus	Stability	Self-controllability	Other-controllability
Environmental factor	External	Unstable	Uncontrollable	Un-controllable
Non-collaborative buyer actions	External	Unstable	Uncontrollable	Controllable

However, the nature of our study limits our ability to draw conclusions concerning the causal relationships between the factors identified. As we were unable to control for the impact that other factors (e.g., strikes by cleaning personnel during the contract period) had on passenger satisfaction, these preliminary findings require further testing.

4.4 HYPOTHESIS DEVELOPMENT

4.4.1 Emotions

By combining the insights gained from our exploratory case study and the causal dimensions – emotion links presented in Table 4.1, we can now formulate hypotheses that are grounded in empirical and theoretical insights. The formulated testable hypotheses we analyze the causal search process in a structured manner to determine motivational effects of environmental factors and non-collaborative buyer actions. The causal search process that managers, which are confronted with a failure to achieve contractual

outcomes due to environmental factors, go through can be visualized in the following manner:

Outcome (failure to achieve contractual outcomes) → Cause
(environmental factor) → Essential causal dimension (stability:
unstable) → Emotion (hope) → Motivational effect (positive)

Given the realization that the effect of environmental factors on contractual outcomes will change over time, the manager will be hopeful that contractual outcomes can be achieved in the subsequent period. The positive emotion that is experienced by the manager will therefore lead to an increased motivation to work towards achieving the contractual outcomes (Weiner, 1986, 2018). Based on this insight, we formulate the following hypothesis:

Hypothesis 1. The recognition that a failure to achieve contractual outcomes was caused by environmental factors positively affects achievement motivation.

The causal search process that managers, which are confronted with a failure to achieve contractual outcomes due to non-collaborative buyer actions, go through can be visualized in the following manner:

Outcome (failure to achieve contractual outcomes) → Cause (non-
collaborative buyer action) → Essential causal dimensions (locus:
external, other-controllability: controllable) → Emotion (anger) →
Motivational effect (negative)

Given the realization that the effect of non-collaborative buyer actions on contractual outcomes is under the control of the buyer, the manager will experience anger towards the buyer. These negative emotions will result in a decreased motivation to achieve contractual outcomes (Rudolph et al., 2004; Weiner, 2018). Based on this insight, we formulate the following hypothesis:

Hypothesis 2. The recognition that a failure to achieve contractual outcomes was caused by non-collaborative buyer actions negatively affects achievement motivation.

4.4.2 Attributional Biases

Given that the causal search process of managers is affected by attributional biases, the classification of environmental factors and non-collaborative buyer actions along the causal dimensions is affected by their attribution style (Kent and Martinko, 1995a). That is, the *essential causal dimensions* that are ascribed to environmental factors and non-collaborative buyer actions differ by manager. Consequently, the motivational effects that are a result of the assigned essential causal dimensions are different across managers. When confronted with a failure to achieve contractual outcomes, managers with optimistic attribution styles generally believe that causes of the failure are ‘external, unstable and uncontrollable’ (Abramson et al., 1978; Douglas and Martinko, 2001). Managers with pessimistic attribution styles tend to display the opposite pattern, as they generally perceive causes of failures to be ‘internal, stable and controllable’. Previous studies have found that optimists are generally more effective in dealing with failure than pessimists in *inter-personal* settings (Seligman and Schulman, 1986).

We argue that pessimists are more effective in dealing with failures than optimists in *inter-organizational* settings. While managers with optimistic attribution styles blame failures on external factors that are not under their control, managers with pessimistic attribution styles believe that they can exert control over causes of contractual outcomes. The latter type of managers will therefore engage in proactive actions to mitigate effects of environmental factors and non-collaborative buyer actions on contractual outcomes (Ellis, Schockley, and Henry, 2011). Take for example the weather conditions discussed in the exploratory case study. Having recognized that poor weather conditions require additional cleaning capacity, the cleaning services supplier started using weather forecast as an input for the capacity planning process. Similarly, the transition manager of the supplier engaged in proactive discussions with its counterpart to ensure that the buyer was aware of the effects of its non-collaborative buyer actions. Since such mitigative actions would only be initiated by managers with a pessimistic attribution style, we argue that pessimists will be more motivated to achieve contractual outcomes. Based on these insights we formulate the following moderation hypotheses:

Hypothesis 3. The positive relationship between ‘the recognition that a failure to achieve contractual outcomes was caused by environmental factors’ and ‘achievement motivation’ is stronger when the attribution style of suppliers’ managers is more pessimistic.

Hypothesis 4. The negative relationship between ‘the recognition that a failure to achieve contractual outcomes was caused by non-collaborative buyer actions’ and ‘achievement motivation’ is weaker when the attribution style suppliers’ managers is more pessimistic.

The hypothesized relationships are visualized in Figure 4.3.

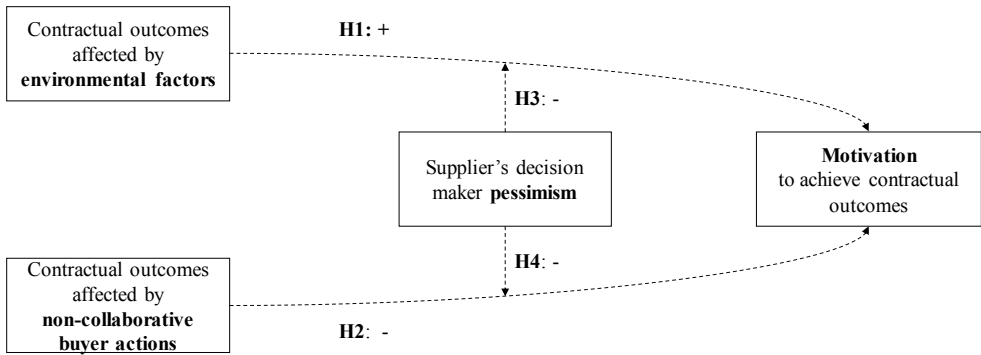


Fig. 4.3. Conceptual Model

4.5 SCENARIO-BASED EXPERIMENT

4.5.1 Experimental Design and Participants

A scenario-based role-playing experiment allows us to test our hypotheses through clear temporal separation of cause and effect and randomization to rule out spurious causes (Rungtusanatham, Wallin, and Eckerd, 2011; Siemsen, 2011). Our experiment employs a 2 (contractual outcomes affected by environmental factors) $\times$ 2 (contractual outcomes affected by non-collaborative buyer actions) $\times$ 2 (attribution style) mixed design. This design combines two between-group factors that are manipulated through the use of vignettes and a within-group factor (attribution styles), variation in

attribution styles occurs naturally due to personal differences between our participants. We followed the three-stage creation and validation process proposed by Rungtusanatham et al. (2011) to design and validate vignettes for our scenario-based experiment. First, we studied the research context for role playing and identified factors of interest by conducting an exploratory case study. Using the insights gathered, we then interviewed two practitioners (a consultant and a project manager) to identify roles that capture the research context and factors of interest, while at the same time being roles that a wide range of participants might be able to take on. During these interviews five potential roles were identified. One of which, the role of project manager, was selected since it best captured the research context and factors of interest. Second, we developed a series of vignettes for use with our practitioner sample, including one common module and four experimental cues modules that capture different levels of the between-group factors. Third, we asked six practitioners and five academics to review our vignettes for clarity and missing information. Some minor corrections were made based on the feedback we received. To test for issues relating to external and convergent validity (Bachrach and Bendoly, 2011), we then pilot-tested our experimentation protocol, the realism of our vignettes, and our manipulation checks with separate samples of 43 undergraduate students (recruited through the subject pool of a European business school) and 24 practitioners (recruited through LinkedIn). While these pilot-tests revealed no issues concerning external and convergent validity, we did receive feedback on some minor mistakes in the instructions, and these were subsequently corrected.

In the common module of our vignettes we asked participants to role-

play a project manager in a decision-making role at a contract manufacturer of organic cosmetics. The organization had been tasked with developing and manufacturing a premium shampoo. A performance-based contract had been put in place that tied compensation to on-time (within one year) and within-budget completion of the project. The project manager had been asked to manage the development of the shampoo so that the deadline and budget would be met. Participants were informed that the project manager had accepted the assignment and were provided with more detailed information on the project. They were subsequently given project updates containing information about other factors that could explain failures. Participants were then randomly assigned to one of four treatments captured in the experimental cues modules. Participants were confronted with static or changing regulations that the shampoo design had to conform to (contractual outcomes affected by environmental factors) and a manager who did or did not demand a change in the design due to personal preferences (contractual outcomes affected by non-collaborative buyer action). All participants were then informed that the shampoo design had not been completed within the set timeframe and that they would not receive the part of their compensation that was tied to the achievement of contractual outcomes. Having experienced this outcome in the first year, the project manager was given the option to salvage the project during the second year. We then measured the motivation of each participant to achieve contractual outcomes during the second year. The full instructions for the experiment, including the scenarios used, are available from the authors upon request.

Participants were recruited through the Prolific online subject recruitment platform (prolific.ac) developed at Oxford University. Various

studies have demonstrated that data obtained through online subject recruitment platforms are at least as reliable as those obtained via traditional data collection methods (e.g., Buhrmester, Kwang, and Gosling, 2011; Sprouse, 2011). However, the fact that widely used platforms such as MTurk were not explicitly designed for scientific research results in challenges relating to transparency (Palan and Schitter, 2018). Prolific addresses these challenges by explicitly informing participants that they are being recruited for participation in scientific research and by facilitating the use of transparent recruitment procedures. Therefore, the platform has attracted attention among supply chain scholars (Duhadway, Carnovale, and Kannan, 2018).

To recruit participants that would be suitable proxies for the real-world roles in question and to thereby avoid possible confounds and ensure the generalizability of results, we recruited practitioners (individuals who had completed their studies and were employed at the time of the study) rather than students (Bachrach and Bendoly, 2011; Mir et al., 2017). Due to the diverse nature of organizations that act as suppliers, we chose not to use any additional filters. Based on these criteria, our participant pool consisted of 11,322 eligible participants. To minimize the impact of environmental distractions on the level of attention paid to the task (Palan and Schitter, 2018), potential participants were informed that the study was to be completed in an environment where there would be no distractions. In addition, they were informed that their attention levels would be monitored throughout the study such that only those who paid adequate attention would be compensated for their participation (\$10.55 per hour). This yielded completed responses from 405 participants. The 325 participants who passed

the attention check were aged between 20 and 61 ($M = 35.33$, $SD = 8.75$), and 187 of them were women (57.5%). The number of years of work experience of our participants ranged between 1 and 45 years ($M = 12.68$, $SD = 9.31$).

4.5.2 Measures

Manipulation Checks

To test whether our manipulations were effective, we used an adapted three-item measurement scale based on the environmental uncertainty scale developed by Celly and Frazier (1996). Participants were asked to indicate on a 3 item, five-point semantic differential scale whether the ‘environmental requirements’ and ‘buyer’s actions’: “make it less likely that your effort will result in you receiving a bonus – make it more likely that your effort will result in you receiving a bonus”, “make it more difficult to predict whether you will meet the product development deadline – make it less difficult to predict whether you will meet the product development deadline”, “decrease the likelihood of meeting the product development deadline – increase the likelihood of meeting the product development deadline”.

Dependent Variable

To measure motivation to achieve contractual outcomes, we used the five-point Likert scale developed by Erez and Judge (2001). We asked participants to indicate to what extent they agreed with the following three statements: “I really want to succeed in this task,” “I look forward to doing the same task,” and “Because I am not motivated to do well, I will probably not perform well as a result (reverse-coded).”

Table 4.3
Descriptive statistics and correlations

	Mean	SD	1	2	3	4	5	6
1 Environmental factor			-					
2 Non-collaborative buyer actions			-.07	-				
3 Motivation	3.75	.81	.15**	-.26**	(.75)			
4 Pessimism	73.90	11.29	-.06	.09	.02	(.72)		
5 Self-controllability	6.10	1.67	-.20**	.16**	-.20	.18**	(.74)	
6 Other-controllability	3.61	1.60	.13**	-.29**	.13*	-.07	-.23**	(.70)

Notes: Cronbach's alphas are shown on the diagonal.

* Correlation is significant at $p \leq .05$ level (two-tailed). ** Correlation is significant at $p \leq .01$ level (two-tailed).

Moderator

To measure the attribution style of our participants, we adopted the Member Attribution Style Questionnaire (Martinko et al., 2007a). This questionnaire contains nine negative employment scenarios. Participants were asked to indicate on a seven-point Likert scales the extent to which they believed that the causes for each of the nine scenarios were either “completely due to me” or “completely due to other people or circumstances,” and the extent to which these causes were likely to exist in the future, ranging from “always present” to “never present.” The scores were summed such that lower scores reflected decision makers with more pessimistic self-attribution styles and higher scores reflected decision makers with more optimistic self-attribution styles. Descriptive statistics and correlations are provided in Table 4.3.

Dependent Variable (Post-hoc Analysis)

To measure perceived self- and other-controllability of causes we adopted the Causal Dimension Scale II (McAuley, Duncan, and Russell, 1992).

4.6 ANALYSIS AND RESULTS

4.6.1 Manipulation Checks

To establish whether our treatments were effective in capturing differing levels of our core constructs, we carried out manipulation checks (Bachrach and Bendoly, 2011; Rungtusanatham et al., 2011). Separate one-way ANOVAs yielded strong effects in the expected direction for our manipulations of contractual outcomes effected by environmental factors ($M = 2.91$ vs. 1.88 , $p = .000$, $\eta^2 = .231$) and contractual outcomes affected by non-collaborative buyer actions ($M = 2.94$ vs. 1.63 , $p = .000$, $\eta^2 = .361$) on the respective manipulation checks.

4.6.2 Hypothesis Testing

We used SPSS 25.0 combined with the PROCESS bootstrapping macro to conduct regression analyses to test our hypotheses. The regression results are presented in Table 4.4. First, we hypothesized that contractual outcomes being affected by environmental factors would be positively related to motivation to achieve contractual outcomes, whereas contractual outcomes being affected by non-collaborative buyer actions would be negatively related to motivation to achieve contractual outcomes. Our results provide support for both hypotheses 1 and 2. Contractual outcomes being affected by environmental factors was found to have a positive effect on motivation to achieve contractual outcomes ($\beta = .14$, $p = .012$). Conversely, contractual

outcomes being affected by non-collaborative buyer actions was found to be negatively related to motivation to achieve contractual outcomes ($\beta = -.25$, $p = .000$).

Table 4.4
Regression results

Predictor	<i>Motivation to achieve contractual outcomes</i>				
	β	<i>SE</i>	<i>t</i>	R^2	ΔR^2
Step 1				.09	.09
Environmental factors	.14*	.09	2.52		
Non-collaborative buyer actions	-.25**	.09	-4.71		
Step 2				.11	.02**
Environmental factors	.22**	.09	2.56		
Non-collaborative buyer actions	-.42**	.09	-4.93		
Attribution style	.09	.07	1.31		
Environmental factors * attribution style	-.23**	.09	-2.64		
Step 3				.09	.00
Environmental factors	.23**	.09	2.60		
Non-collaborative buyer actions	-.42**	.58	-1.31		
Attribution style	-.07	.01	-1.13		
Non-collaborative buyer actions * attribution style	.05	.01	.60		

Notes: Standardized regression coefficients are reported.

* $p \leq .05$ level (two-tailed). ** $p \leq .01$ level (two-tailed).

Second, we hypothesized that the main effects would be moderated by decision maker optimism. Our results provide support for hypothesis 3, since the interaction between attribution style and contractual outcomes affected by environmental causes was found to be significant ($F[1, 320] = 6.98$, $p = .009$, $\Delta R^2 = 0.019$). In Figure 4.4, we plotted values across the range of motivation to achieve contractual outcomes scores for higher (i.e., one

standard deviation above the mean) and lower (i.e., one standard deviation below the mean) levels of decision maker optimism. While the slope for lower decision maker optimism was found to be positive and significant ($b = .45$, $t = 3.71$, $p = .000$), the slope for higher decision maker optimism was found to be negative and non-significant ($b = -.01$, $t = -.07$, $p = .941$).

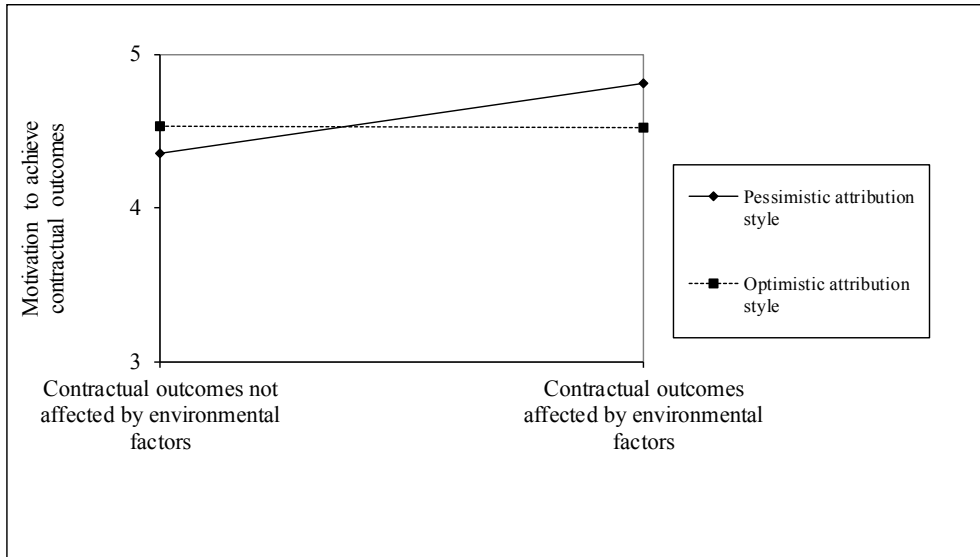


Fig. 4.4. Interaction

Our results did not provide support for hypothesis 4, since the interaction between decision maker optimism and contractual outcomes affected by non-collaborative buyer actions was found to be non-significant ($F[1, 320] = .36$, $p = .551$, $\Delta R^2 = 0.001$).

4.6.3 Post-hoc Analysis

We follow the recommendation of Hollenbeck and Wright (2017) to engage in post-hoc exploratory data analysis to explain findings that we did not originally expect. To further our understanding of how attribution styles

affect motivation to achieve contractual outcomes in the context of PBC, we develop additional theory-driven hypotheses that we then test.

To operationalize the concept of attribution styles, scholars have developed several measurement scales that capture attributional biases by presenting individuals with distinct scenarios (Kent and Martinko, 1995a; Martinko et al., 2007a; Proudfoot et al., 2001). In developing these scales scholars have aimed to capture how attributional biases influence an individual's perception of the locus, stability and controllability of causes. However, since they found their measurements of the locus and controllability dimensions to be highly correlated, they decided to collapse these two dimensions into a single dimension. That is, they dropped the questions used to measure perceptual differences on the controllability dimension. Based on a critical evaluation of the scale development processes employed, we posit that this step is problematic for two reasons. First, the relationship between the locus and controllability dimensions has been suggested to vary across contexts (Kent and Martinko, 1995b; Russell, McAuley, and Tarico, 1987); dropping questions that measure perceptual differences in the controllability of causes could therefore decrease the explanatory power of the attribution styles concept for specific contexts. Second, scholars appear not to have measured both sub-dimensions of controllability (self- and other-controllability) as the questions that were used appear to measure only self-controllability. If perceptual differences relating to other-controllability are ignored, the motivational effects thereof are unlikely to be captured.

To test our insight that the attribution styles measurement scale developed by Martinko et al. (2007a) used in our scenario-based experiment

does not capture both sub-dimensions of controllability, we formulate two hypotheses. First, based on the insight that these scholars used questions that capture self-controllability, and that this measurement of ‘controllability’ correlates with locus, we formulate the following hypothesis (which we expect to accept):

Hypothesis 5. Decision maker optimism is positively associated with self-controllability.

Second, we seek to test the insight that no questions had been added that measured ‘controllability’ in terms of ‘other-controllability’. We formulate the following hypothesis (which we expect to reject) to test this insight:

Hypothesis 6. Decision maker optimism is associated with other-controllability.

Table 4.5

Regression Results Post-hoc Analysis

Predictor	β	SE	t	p	R^2
(Dependent variable: self-controllability)					.031
Decision maker optimism	.18**	.01	3.19	.002	
(Dependent variable: other-controllability)					.004
Decision maker optimism	-.07	.01	-1.13	.257	

Notes: Standardized regression coefficients are reported.

** $p \leq .01$ level (two-tailed).

As can be seen in Table 4.5, our results provide support for hypotheses 5 but not for hypothesis 6. Decision maker optimism is shown to be positively associated with self-controllability ($\beta = .18$, $p = .002$), and we find no significant association between decision maker optimism and other-controllability ($\beta = -.07$, $p = .257$).

4.7 DISCUSSION

4.7.1 Theoretical Contributions

Our research makes three main contributions to the behavioral supply management and contracting literature. First, we demonstrate the need to go beyond behavioral assumptions propagated by established theories originating in the field of economics. Specifically, our findings reveal that suppliers' managers are not (always) rational decision makers (Bendoly et al., 2006). Rather than responding rationally when confronted with negative contractual outcomes, these managers rely on cognitive processes to assign responsibility for causes of contractual outcomes. That is, through attributional activities supply chain managers determine the source of the cause, who has control over the cause, and whether it is persistent or temporary (Weiner, 1986). By applying these attributional dimensions to study PBC, we find that contrary to what the current contracting literature would predict (Eisenhardt, 1989a), not all sources of outcome uncertainty decrease the effectiveness of PBC. We find that environmental factors such as weather conditions and regulation do not decrease its effectiveness. On the other hand, buyers engaging in non-collaborative actions that adversely affect contractual outcomes do decrease the effectiveness of PBC since suppliers hold buyers responsible for shortfalls in performance (Steinbeck et

al., 2018). This finding implies that PBC can be used effectively in a far wider range of contractual settings than had been suggested by previous studies.

Second, we reveal that attributional biases in suppliers' managers conditions how they respond to factors that affect contractual outcomes. While managers with a pessimistic attribution style believe that they can mitigate the effects of environmental factors, those with an optimistic attribution style do not. Consequently, the effectiveness of PBC can vary across firms due to the attribution styles of suppliers' managers. This means that in addition to contextual factors of contractual settings, effects related to attribution styles of managers should be taken into account when designing performance-based contracts.

Third, we show that attribution styles as measured in previous studies fail to take account of an essential sub-dimension of controllability. In line with previous studies, we find that attributional biases that affect perceptions of self-controllability are indeed captured in the attribution styles framework (Kent and Martinko, 1995a; Martinko et al., 2007a; Proudfoot et al., 2001). However, our results reveal that attributional biases that affect perceptions of other-controllability are *not* captured in the current framework. Based on these insights, we argue that the attribution styles framework needs to be revised. We believe that the explanatory power of this concept could be increased considerably by including perceptual differences concerning the extent to which causes of contractual outcomes are under the control of others.

4.7.2 Managerial Contributions

Although the findings we have presented would have to be replicated to allow firm conclusions to be drawn, the findings nevertheless have some preliminary managerial implications. If supply chain managers recognize the role that causal attributions and attribution styles play in how PBC affects supplier behavior, they can design and manage performance-based contracts more effectively. More specifically, our findings could enable supply chain managers to make an accurate evaluation of the contexts in which PBC is likely to be effective. This study reveals that non-collaborative buyer actions play a more prominent role than environmental factors, and that this should be taken into account when designing performance-based contracts. Most importantly, we show that effectiveness of PBC does not only depend on what causes outcome uncertainty, but also varies according to the individual. The attribution styles of decision makers in supply firms have been shown to have an impact on the effectiveness of PBC in uncertain contexts. More specifically, decision makers with a pessimistic attribution style are shown to deal more effectively when a failure to achieve contractual outcomes is caused by environmental factors. This is because managers with a pessimistic attribution style believe that they can exert control over the effects of environmental factors, whereas managers with an optimistic attribution style do not. For suppliers that employ pessimistic decision makers, PBC would be effective, even in uncertain contexts.

4.7.3 Limitations and Future Research

Despite making contributions to both theory and practice, our studies have several limitations. Our first study was conducted in a single organization

whose specific characteristics could limit the generalizability of our findings to a broader set of organizations. First, the organization we studied is a semi-public organization. The management style and organizational culture associated with public organizations could limit the generalizability of our findings to private organizations. Second, the study was conducted in a single country, the culture of which could affect how specific causes of outcome uncertainty are perceived. We addressed some of these limitations by conducting an experimental study. However, this study has limitations of its own. Findings based on experimental designs have been criticized for not being generalizable beyond the lab setting due to characteristics of experimental practices (low monetary stakes, high levels of scrutiny, and tasks that are abstract in nature) and the convenience samples used. We minimized the impact of these factors by conducting our studies with practitioners and designing a scenario based on input from experienced practitioners.

We would like to propose three main avenues for future research. First, we would encourage researchers to explore how causal attributions other than those identified by Weiner (1985, 1986) affect whether PBC can be used effectively to govern supplier behavior. Eberly et al. (2011, 2017) find that ‘relational’ attributions are an additional dimension of locus of causes. Relational attributions capture the explanations made by an individual, as the individual assigns the cause of a performance related event to the relationship the individual has with another person. Relational attributions could be of immediate relevance to contracting research since our results reveal that the supplier’s ability to achieve outcomes is to a great extent dependent on the buyer’s actions. Harvey et al. (2014) identified

several additional dimensions that could extend our understanding of the way in which PBC affects supplier behavior: intentionality, globality, consistency, consensus, and distinctiveness. Dasborough and Ashkanasy's (2002) discussion of intentionality suggests that this is another potential dimension of controllability which could provide valuable insights in terms of how non-collaborative buyer actions affect supplier behavior. More specifically, if it can be established whether suppliers perceive buyers to be acting intentionally, the effect of non-collaborative buyer actions can be studied in more detail. Second, we would like to propose that the relationship between perceptions of other-controllability and attribution styles should be investigated further. Our study reveals that, despite the claims made in previous studies, the measurement scale developed Martinko et al. (2007a) does not capture how attribution styles affect perceived other-controllability. Adding other-controllability as a separate dimension when measuring attribution styles could enhance the explanatory power of this concept. Third, in this study we have taken into account only the supplier's attributions and attribution styles. Contracting scholars could examine the attributions of both buyers and suppliers to study effects of conflicting attributions (see Martinko et al., 2007a).

CHAPTER 5

Servitization: How property rights and obligations tied to selling performance outcomes drive manufacturers to engage in a supply chain realignment process

5.1 INTRODUCTION

The development by manufacturers of hybrid product-service offerings (Uлага and Reinartz, 2011), or ‘servitization’, is now a prominent concern in practice (Visnjic et al., 2013) and in the operations management literature (Rabetino et al., 2018; Visnjic and Van Looy, 2013). To improve their competitive position, industry leaders such as Caterpillar, Hitachi, and Rolls-Royce have moved to offering customer centric bundles of products and services (Cusumano, Kahl, and Suarez, 2015; Neely, 2009; Visnjic et al., 2017). An illustrative industry example is the Power-by-the-Hour concept through which Rolls-Royce offers a bundle of engines and maintenance services to airlines (Visnjic and Van Looy, 2013). The move towards servitization has generally enabled manufacturers to improve their competitiveness by closely aligning the delivery of product functionality and performance to their customers’ core objectives (Wang, Lai, and Shou, 2018; Worm et al., 2017). However, failures to extract financial rewards from offering product-service bundles are widely documented in academic literature (Gebauer, Gustafsson, and Witell, 2011; Han, Kuruzovich, and Ravichandran, 2013; Neely, 2009; Suarez, Cusumano, and Kahl, 2013).

The extant servitization literature has emphasized a resource-based view to examine the manufacturers' transition to integrated product-service offerings (e.g., Fang, Palmatier, and Steenkamp, 2008; Oliva and Kallenberg, 2003). In broad terms, this literature is concerned with the (service) operations-related resources and capabilities that manufacturers need to develop, or access via their supply chain counterparts, to realize a successful transition to servitized offerings (Rabetino et al., 2018). Inherent in this literature stream is therefore the argument that servitization entails change within the manufacturing firm (e.g., in terms of resource / capability base, organizational structure and processes) and across its supply chain (e.g., in terms of SC positioning), and that such change needs to be managed (Reim, Parida, and Örtqvist, 2015). However, the extant literature appears to have underplayed another important aspect of change that servitization entails, which is, change in allocation of property rights and obligations resulting from shifting modes of product / equipment ownership. This is driven by changes in technological, market and commercial factors altering what is the most economically efficient distribution of rights and responsibilities between servitized manufacturers and their customers. Such developments enable, in theory at least, manufacturers to retain product ownership and focus on delivering product performance and / or a capability to their customers (Baines et al., 2011). A corollary to this argument is that alignment within the manufacturing firm and across the supply chain is required to address potential misfits between existing structure of ownership (and associated incentives) and operations processes, and the structure and processes that have become economically efficient due to above-outlined technological and market changes.

Despite the above, the existing OM research on servitization has hitherto paid only limited attention to the issue of ownership (a rare exception is Lay, Schroeter, and Biege, 2009) and its implications for firm-level operations strategies, processes, and the management of supply chain relationships (Foss and Saebi, 2017; Walker et al., 2015). This study addresses this literature deficiency by seeking to understand in-depth how considerations of product ownership and (re)allocation of associated rights and obligations trigger processes of alignment within the manufacturing firm, between manufacturer and customer, and further upstream the supply chain. To pursue this research objective, we adopt a property rights theory lens that helps explain how the partitioning of property rights and the distribution of income generated by a bundle of rights influence incentive alignment (or lack thereof) between supply chain counterparts (Coase, 1960). In addition, a property rights perspective emphasizes the dynamics of efficient allocation of property rights by considering adaptations to property rights distribution in response to technological and socio-economic changes (Kim and Mahoney, 2005). In line with our focus on the process of alignment, we employ a process research design to study how reallocating rights and obligations drive supply chain alignment over time (Langley, 1999; Van De Ven and Poole, 1995).

By engaging in theory elaboration (Ketokivi and Choi, 2014), we contribute to the existing servitization research in the following ways. First, we show that the structure of product ownership matters when it comes to alignment of objectives, incentives and operations processes across multiple supply chain tiers. Second, our empirical study shows how exactly ownerships matters: it reveals the mechanisms of alignment, but more

importantly the specific processes by which alignment occurs both within the manufacturing firm, but also between the manufacturing firm and its customers and suppliers. Third, we elaborate on a process view of supply chain alignment (see Selviaridis and Spring, 2018) by showing the sequence and interrelationships between manufacturing firm (internal) alignment, customer alignment and supplier alignment. Fourth, we make an empirical contribution by analyzing how issues concerning ownership of data (e.g., product usage data) influence the partitioning of property rights in relation to the product itself, and the most efficient allocation of associated risks and rewards between supply chain counterparts.

5.2 LITERATURE REVIEW

5.2.1 Servitization of Manufacturing and Service-based business models

The contemporary servitization literature has resulted from the convergence of two rather separate strands. One has its origins in a strategic concern for differentiation and value appropriation in capital equipment sectors subject to increasing competition from low-cost manufacturers. Early examples of this were Potts (1988), Wise and Baumgartner (1999) and, somewhat later and building on the latter, Davies (2004). The broad argument of this literature is that manufacturers need to extract value from the whole life-cycle of capital goods by ‘moving down the supply chain’ (Wise and Baumgartner, 1999) to take over activities such as maintenance that their customers had hitherto undertaken. In some instances, the consequences of such moves for the structure of incentives is part of the argument: for example, Davies (2004) suggests that capital equipment manufacturers who

come to bear the cost of maintenance of these assets will be incentivized to design future products so as to reduce maintenance effort and costs.

The second strand originates in industrial ecology (Beuren et al., 2013). This is important for our present concerns because, whereas the strategic servitization literature emphasizes competitive positioning and vertical integration issues, this second strand is centrally concerned with ‘dematerialization’ through access-based business models (Stahel, 2005; Stoughton and Votta, 2003). The emphasis here is on the incentivization of the producer to produce less to achieve the required outcome for the customer, and in other ways to reduce the environmental impact of the whole system. In some ways this has led to the recent interest in the circular economy (e.g., Spring and Araujo, 2017) and is part of a wider socio-economic shift toward user accessing products rather than owning them (Rifkin, 2000).

Baines and colleagues (e.g., Baines and Lightfoot, 2013) combine the ideas from these two strands in a typology of different forms of servitization: base services, intermediate services and advanced services. Within this scheme, base services are defined as “an outcome focused on product provision”, intermediate services are defined as “an outcome focused on maintenance of product condition” and advanced services are defined as “an outcome focused on capability delivered through performance of the product” (2013, p. 5). In advanced services, the manufacturer is responsible for and paid based on performance, and the progression from base to intermediate to advanced services is characterized in terms of the respective roles of each firm in activities such as operation and maintenance of the asset. It is notable, however, that this literature is much less concerned about the

implications of asset ownership, which is surprising, given the emphasis in classic examples such as Rolls Royce's 'Power by the Hour' and in the other cases explored by Davies (2004) and Visnjic and Van Looy (2013) on the retention of ownership by the manufacturer, and some of the consequences that flow from this structural change. Although the question of ownership is touched upon in the servitization literature, then, it is typically not tackled head on as a key determinant of operations strategies, processes and supply chain relationships [not sure of this form of words].

5.2.2 A Property Rights Perspective on Servitization

Despite the lack of a sustained examination of the implications of ownership in the empirical servitization literature, it has been argued conceptually that product or equipment ownership is a key defining characteristic of services (Spring and Araujo, 2009). Ownership can be understood more precisely as a particular allocation between the customer, supplier, and possibly other firms such as third-party maintenance providers, of property rights over the product. Typically, in advanced forms of servitization such as 'advanced services' (Baines and Lightfoot, 2013), the ownership of the product is not transferred to the customer who, instead, obtains rights to use the product for a specified period (Hypko, Tilebein, and Gleich, 2010). A simple example that illustrates differences in the allocation of property rights between customers and manufacturers is ownership versus leasing of a car. Owning a car gives customers the right to use it to their desire and to make alterations to it. Leasing a car on the other hand limits the ways in which customers are allowed to use a car (e.g., maximum mileage per year) and prohibits customers from making alterations to a car. At the same time, owning a car

makes customers responsible for the maintenance of the car whereas leasing a car obliges the supplier to maintain the car such that customers can use it. A property rights perspective is useful for explaining such reallocations of ownership-related rights and obligations and shifts of associated incentives (in terms of risks and rewards), as manufacturers move towards service-based business models (Lay et al., 2009).

The property rights perspective is a theory of contracting which postulates that economic activity entails the exchange of bundles of property rights (Coase, 1960). Property rights are defined as the rights to use, to earn income from, and to transfer or exchange the assets and resources (Kim and Mahoney, 2005). The *ex-ante* allocation of rights and the *ex-post* distribution of income generated by a set of property rights influences incentives and behavior of contracting parties. Bundles of property rights in theory should be formed such that owners of these bundles are the most capable and properly incentivized parties to achieve efficient production. In the context of performance-based service contracts which tie payment to product performance (e.g., equipment availability), for instance, manufacturers possess crucial product-related knowledge and are incentivized to optimize maintenance activities. They may also be motivated to make performance-improvement-related investments if they can retain control and income rights over the product or equipment after contract end (Selviaridis and Wynstra, 2015).

An important insight of property rights theory is that different actors can hold *partitions of rights* to specific facets of the same resource (Kim and Mahoney, 2005), which implies that: a) different types of property rights exist, and b) shared ownership is an option, especially when different degrees

of ownership (e.g., acquisition vs. licensing) are possible (Mazzola et al., 2018). The extant literature has identified several types of property rights which converge to the following main ones: 1) the right to use a resource, 2) the right to benefit financially from resource use, 3) the right to exclude others from resource use, 4) the right to change the form /substance of a resource (i.e., maintain and upgrade), and 5) the right to alienate or transmit (i.e., to transfer all/some rights and generate income) (Furubotn and Pejovich, 1972; Hart and Moore, 1990; Silver, 1989; Tietze, Pieper, and Herstatt, 2015).

The last three types of property rights include the following important obligations: 1) the obligation to cover losses from resource use, 2) the obligation to maintain resource and 3) the obligation to dispose of the resource at the end of its useful life (Kim and Mahoney, 2005). All property rights and obligations are transferred to the customer in product-based offerings. However, when products are sold as services property rights tend to be divided between the customer and manufacturer. In advanced services, for example, manufacturers retain many of the rights (e.g., the right to exclude others from resource use, the right to change from/substance of a resource and the right to alienate or transmit) associated with the fact that they retain ownership of the product. Consequently, service-based business models provide organizations with far more flexibility to allocate rights and obligations and associated risks and rewards in a manner that minimizes economic inefficiencies.

The existence of different types of rights that are divided between manufacturers and customers also suggests that shared ownership is an option. While in product-service offerings the customer, generally speaking,

waives ownership-related rights, different models of ownership are adopted in practice, one of which is joint ownership via special purpose vehicle or leasing models (Hypko et al., 2010). In addition, a distinction is drawn between *ownership during*, and *ownership after*, the contract period. Ownership after the use period include rights to upgrade and re-use, or sell equipment to others as well as responsibilities for disposal and recycling (Lay et al., 2009). In manufacturing industries, as compared to large construction projects, ownership of equipment is rarely transferred back to customers after contract end, albeit this is still an option (Hypko et al., 2010).

Property rights analysis has traditionally focused on either the firm level or the institutional level (Hart and Moore, 1990; Kim and Mahoney, 2005), and its application to the management of supply chains (and to Operations Management more broadly) has been very limited (see Walker et al., 2015). We suggest that property rights theory is suitable for addressing the critical question of ownership in relation to servitization. More specifically, a property rights perspective is useful for analyzing how customers, manufacturers and their upstream suppliers deal with the partitioning of rights and the separation between product ownership and control in a servitization context.

5.2.3 Servitization and Supply Chain Alignment

As result of the reallocation of property rights and obligations (and associated incentives), servitization has considerable implications for the structure and management of supply chain relationships and associated operations (Johnson and Mena, 2008; Vendrell-Herrero et al., 2017). The existing literature stresses the imperative role of alignment both within the

manufacturing firm and across the supply chain i.e. with customers and upstream suppliers (Alghisi and Sacconi, 2015). Nonetheless, it also notes relevant challenges such as customer reluctance to increase supplier dependence, limited information sharing with upstream suppliers, component supplier visibility of product use patterns, and misaligned business models and contracts between manufacturers and their suppliers (Baines and Shi, 2015; Bastl et al., 2012; Finne and Holmström, 2013).

More broadly, the concept of supply chain alignment originates in the operations strategy axiom that a firm needs to align its operations-related resources and capabilities with market requirements (Slack and Lewis, 2002). This has been extended to the supply chain level meaning that a focal firm's objectives and incentives, and those of its suppliers, should be aligned with the performance requirements and incentives of its customers (Lee, 2004; Vachon, Halley, and Beaulieu, 2009). Several mechanisms can be deployed to achieve supply chain alignment: integration of processes across firm boundaries, sharing of data and information, inter-firm collaborative work, design of compatible performance metrics and measurement systems, and alignment of contractual incentives (Frohlich and Westbrook, 2001; Gunasekaran, Patel, and Tirtiroglu, 2001; Narayanan and Raman, 2004). Alignment of performance objectives and incentives across the supply chain is particularly relevant to service-based business models, especially to those that entail performance-based payment mechanisms. For example, availability contracts tie part of manufacturer's compensation to equipment availability targets, thus transferring performance related risks to the manufacturer who now has an incentive to optimize maintenance /repair activities and costs (Datta and Roy, 2011).

Research on supply chain alignment tends to take a contingency view of alignment which occurs in response to customer requirements and supply and demand characteristics (Lee, 2002), and it has largely underplayed the process by which supply chain counterparts interact to align their objectives and incentives. Supply chain alignment can alternatively be thought of as a non-instantaneous, discontinuous process triggered by episodic events which entail learning and adaptation (Selviaridis and Spring, 2018).

5.3 METHODOLOGY

We conducted a longitudinal single case study with embedded units of analysis in order to explore, understand, and explain the transition towards servitization and the complex interplay between objectives, processes and structures as rights and obligations are transferred between supply chain partners (Barratt et al., 2011; Barratt and Barratt, 2011; Soundararajan and Brammer, 2018; Stuart et al., 2002). We studied the supply chain of Health Tech International (HTI), a pseudonym, to elaborate theory on property rights and supply chain alignment (Ketokivi and Choi, 2014). The healthcare sector is a dynamic sector undergoing substantial changes towards outcome-based reimbursement in many countries. HTI is a multinational with European roots that designs and manufactures medical grade equipment and personal health products. HTI generates an annual revenue of about €20 billion and employs over 50,000 people in over 100 countries. We studied the medical imaging division, which accounts for approximately 40 percent of the organization's revenue. Our study focused on sales, maintenance, and operations management related to Magnetic Resonance Imaging (MRI) systems. MRI systems are extremely suitable for advanced services for two

reasons: (1) MRI systems are high-priced assets (approx. €1 million) and (2) MRI systems require extensive maintenance due to their complex nature. We were granted research access to employees, meetings, documents, and supply chain partners of this organization and this enabled us to capture in detail the context within which supply chain alignment occurred over time (Dyer and Wilkins, 1991; Narasimhan and Jayaram, 1998; Voss et al., 2002; Yin, 2009).

5.3.1 Data collection

This field study combines retrospective accounts of events between January 2010 and April 2016 with real time tracing of events between April 2016 and January 2019. We utilized interviewing of key informants at the manufacturer, its customers, and its preferred suppliers as our primary data collection method. Due to the global nature of project teams at HTI, we conducted interviews with personnel located in the Netherlands as well as the United States of America. Relevant informants at HTI were identified and contacted with the help of our main contact person at the organization (a procurement engineer). We obtained additional data by observing a “town hall” meeting and social interactions at the manufacturer by spending an average of one day a week at the focal firm between April 2016 and January 2019. Field notes were written at the end of each day to capture relevant events and emergent theoretical insights. Further data triangulation was achieved by collecting data from the additional sources listed in Table 5.1 (Yin, 2009). Utilizing these diverse data sources increases data reliability (Benbasat, Goldstein, and Mead, 1987; Boyer and McDermott, 1999; Hyer, Brown, and Zimmerman, 1999; Leonard-Barton, 1990) and provides a

stronger substantiation of our research findings (Benbasat et al., 1987; Eisenhardt, 1989b; Voss et al., 2002).

Table 5.1

Data overview.

Source	Type of data	Use in the analysis
<i>Interviews</i>	4 customer interviews. Semi-structured interviews with purchasers and radiologists at hospitals concerning corporate objectives, equipment requirement, types of services purchased, and allocation of rights and obligations tied to purchased services.	Coded for customer alignment initiatives and reallocation of rights and obligations.
	45 manufacturer interviews. Semi-structured interviews with MR business units concerning reallocation of rights and obligations and realignment of objectives, structures and processes.	Coded for reallocation of rights and obligations and customer, internal and supplier alignment initiatives.
	1 supplier interviews. Semi-structured interviews with CEO concerning quality requirements, initiatives to improve quality of components and sub-systems, and rights and obligations of suppliers.	Coded for supplier alignment initiatives and reallocation of rights and obligations.
<i>Internal documents</i>	7 marketing documents. Internal documentation concerning product and service offering. As well as contractual agreements used to sell products and services.	Provides background information concerning products and services offered. Coded for customer alignment initiatives, rights and obligations.

	600 procurement documents. Contractual agreements with all preferred suppliers.	Coded for supplier alignment initiatives, rights and obligations.
	5 general documents. PowerPoint presentations concerning strategic priorities and improvement initiatives.	Coded for customer, internal and supplier alignment initiatives.
	8 newsletters. Internal newsletters concerning the developments in the MR business unit.	Coded for customer, internal and supplier alignment initiatives.
<i>Observations</i>	63 pictures. Photographs that document town hall meeting, products offered, and production facilities.	Provides background information concerning strategic priorities as well as products and services offered.
	Town hall meeting. Field notes concerning CEO presentation on strategic priorities of organization.	Provides background information concerning strategic priorities.
	Employee interactions. Field notes on social interactions between HTI employees.	Coded for customer, internal and supplier alignment initiatives.
<i>External sources</i>	33 news articles. News articles from various sources concerning product releases, case studies of product implementations, interviews with HTI employees, and financial firm performance.	Provides background information concerning strategic priorities as well as products and services offered.

5.3.2 Analytic method

We systematically analyzed the data using analytic methods for process research as recommended by Langley (1999). Specifically, we started with

narrative strategy and identified three phases in HTI's transition: customer, internal and supplier realignment. We identified episodes in the transition and characterized each episode as being of one episode type: customer, internal or supplier realignment. Episodes were defined as events, or connected series of events, that describe a change in objectives, processes or structures, or as external triggers for such changes. We then employed a process mapping strategy to visualize the sequence of episodes. The 18 episodes identified were the basic unit of analysis in this study (see Berends, Van Burg, and Van Raaij, 2011). The different stages of the analytic method used are summarized in Table 5.2.

Table 5.2

Data analytic method.

Stage	Process
1	a) We iteratively analyzed the interview data related to the transition towards servitization to develop a chronological narrative that captured key events that customers, the manufacturer's business functions and suppliers experienced. From this narrative, we identified three phases: customer, internal and supplier alignment. b) We used internal documentation and news articles to add context to the narratives. This assisted us in tracing the sequence of events and in understanding the contextual nuances of events.
2	We employed a systematic coding process to ensure a high degree of reliability and traceability of our data (McCutcheon and Meredith, 1993; Strauss and Corbin, 1990). a) We created a coding scheme (Appendix E) based on concepts derived from existing literature to capture events related to customer, internal and supplier alignment at objective, process and structure levels. b) We used Atlas.ti to construct a case study database such that we were able to maintain a chain of evidence (Yin, 2009). c) Using Atlas.ti we coded our data by employing a combination of open and closed coding. More specifically, sensitizing concepts

were used to enable us to apply a structured coding approach yet leave room for the identification of additional constructs (Blumer, 1954; Van den Hoonaard, 1997).

- d) Each alignment episode type (i.e., customer, internal and supplier alignment) was coded individually using the process described above.
- 3 The analysis at episode level was followed by an analysis to determine the sequence of episodes. This enabled us to determine in which manner rights and obligations trigger and facilitate the supply chain alignment episodes. The result of this analysis was captured in a process map (Langley, 1999).
- 4 To ensure the reliability and validity of our findings we engaged in the following activities.
- a) We iteratively transgressed between the formulated narratives, our interview transcripts, our codes and relevant literature.
 - b) We consulted internal documentation and news items to verify the validity of our findings.
 - c) During our presence at the organization we presented emerging theoretical insights to key informants to check the validity of our findings.
 - d) We continuously discussed emerging theoretical insights within our research team and with fellow academics to verify the robustness of our findings.
 - e) We asked senior staff of the organization to thoroughly read the manuscript and provide us with feedback on the narratives, the process map, the constructs and the theoretical framework.
-

5.4 FINDINGS

5.4.1 Case Description

In many developed economies around the world, the financial sustainability of the healthcare system has become a serious concern for governments and society. It has become clear that improving performance and cost-effectiveness of healthcare delivery depends on creating shared objectives that align interests and activities of stakeholders in healthcare supply chains. Before 2010 healthcare providers had numerous, often conflicting goals,

including profitability, quality, safety, convenience, patient-centeredness, and satisfaction. A lack of alignment of objectives had led to inefficient care delivery, a focus on production, gaming of the system, and slow progress in performance improvement. Over the past ten years or so, delivering value for patients became the overarching goal of health care supply chains in more and more countries. To achieve this goal, healthcare payers, such as insurance companies, and healthcare providers have begun to implement value-based healthcare since about 2010. Consequently, health outcomes achieved per dollar spent were becoming the main objective for healthcare providers. Recognizing that these changes in the healthcare sector created new business opportunities, HTI's marketing function decided to launch intermediate services in 2011. In addition to buying diagnostic imaging equipment outright, hospitals were offered the option to lease equipment bundled with a diverse offering of maintenance services. This episode is the starting point of our case analysis since it initiated various change episodes that led up to supply chain alignment.

As the market responded favorably to the introduction of intermediate services, HTI's marketing function saw an opportunity in 2013 to further expand its portfolio by introducing advanced services focused on improving operational performance of radiology departments. These long-term contracts (minimum duration of 15 years) involve extensive collaboration between HTI and hospitals to improve hospital operations of radiology departments. That is, the focus of these contracts is no longer solely on the performance of equipment but rather the effectiveness of operations in place to diagnose ailments.

While intermediate and advanced services were well received in the market, HTI soon realized that the payment models had resulted in considerable financial risk. As the promises made to customers in the form of uptime guarantees (and other performance measures) had not been based on actual performance but rather on what the market demanded, it was unclear whether these targets could be met. An internal investigation based on field performance data soon revealed that reliability fell short of the promises made to customers. As few customers monitored performance of its equipment before 2015, actual financial risk exposure was limited. And if customers did monitor performance, they were offered discounts on their service rates as compensation. Overall, the financial impact of poor performance was thus negligible during the first years after the introduction of service-based business models.

However, due to an increasing focus on cost containment, hospitals started to engage in more extensive monitoring of performance delivered by suppliers. At the same time, a legislative change in a core market in 2015 meant that discounts to compensate for performance shortfalls were no longer acceptable. Failing to meet agreed-upon performance targets therefore began to hurt profitability of intermediate and advanced services. Given that HTI's internal objectives had long focused on cost containment and not on the reliability of equipment, considerable changes were needed. Recognizing the importance that reliability of equipment played in the future success of the business, HTI's executive team made reliability a core objective for the design, procurement, supply chain, marketing and quality functions.

To guide the internal transformation towards an organization that was focused on delivering reliable diagnostic imaging equipment, a reliability

team was created in 2016. This team began to build reliability models based on sensor data to gain a better understanding of the reliability of the imaging equipment at the sub-system level (in 2016) and component level (in 2018). These models were subsequently used to provide input for design teams such that design flaws in components could be remedied. Reliability models and notifications based on sensor data also enabled HTI to further improve proactive and predictive maintenance processes that had been implemented in 2015.

Recognizing that reliability targets could only be achieved in collaboration with its component suppliers, the procurement function began to formalize contractual requirements for its suppliers in 2016. All preferred suppliers were required to sign an umbrella purchasing agreement and a quality agreement in 2016 to formalize warranty claims and minimum quality requirements. This was followed by the implementation of change agreements in 2018 to formalize the process required to make changes to components supplied to HTI. Insights gained from the reliability models that had been built were used to identify component suppliers that caused system reliability issues. These suppliers were either replaced or were visited by a supplier quality improvement team, which had been created in 2016. Finally, to elevate advanced services to a strategic level, the strategic ambition was formulated to grow advanced services to account for 35 percent of total revenue by 2020. To achieve this target, a solutions delivery organization was created at the corporate level to equip business functions with capabilities to develop, market, sell and deliver advanced services.

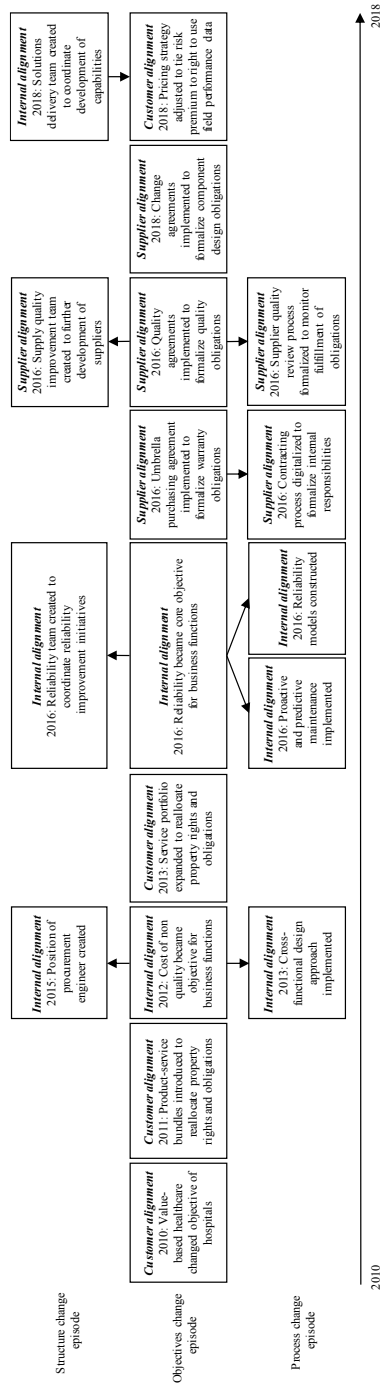


Fig. 5.1. Supply Chain alignment change episodes

The case concludes with the release of a redesigned MRI scanner in September 2018, which had been designed to meet obligations (and associated financial risks) tied to offering advanced services.

Our analysis of the events highlighted in this case description resulted in the identification of three main alignment episode types that led up to supply chain alignment: (1) *customer alignment*, (2) *internal alignment* and (3) *supplier alignment*. Figure 5.1 provides an overview of the change episodes that took place during each of the three episode types and how these change episodes are connected.

In the following sections we analyze how the events that occurred during each of the supply chain alignment episode types affected the alignment of objectives (i.e., goals), structures and processes. We then determine the sequence of these alignment episodes to shed light on the interdependencies of episodes.

5.4.2 Customer Alignment – Redistributing Rights and Obligations between Customer and Manufacturer

In customer alignment episodes, HTI sought to align its corporate objectives with (changing) requirements of its customers. To illustrate how changes in customer requirements drove HTI to realign its corporate objectives by engaging in servitization, we discuss an objectives change episode. No structure and process change episodes related to customer alignment occurred.

Objectives change episode (2011): HTI introduces intermediate services.

As the competitive environment of hospitals changed, more and more hospitals adapted their objectives to focus on delivering value to patients.

This resulted in considerable changes in requirements for manufacturers of diagnostic imaging equipment: “As healthcare rapidly change[d] around the world, so [did customer] requirements for MR scanning. ... More services and faster delivery are the name of the game. ... Elevated clinical performance, accelerated patient management and improved economic value [have become the primary requirements] – all for the life of the system” (HTI, Marketing Document, 2011). This meant that equipment reliability became an important customer requirement and that unscheduled downtime of equipment was no longer an option.

To realign its service offering with these altered customer requirements, HTI’s marketing function decided to introduce intermediate services in 2011. The introduction of these new business models was the first evidence of a shift in marketing strategy, which was geared towards selling “MR as a service” (HTI, Marketing Document, 2016). Customers were given the option to purchase equipment in one of three ways. First, customers could opt to purchase imaging equipment outright (base services), which meant that all property rights and obligations were transferred to the customer. Based on this arrangement, customers were free to purchase maintenance services from a supplier of their choice. Second, customers could opt to purchase equipment bundled with performance-based maintenance services (intermediate services). Based on this arrangement, the customer remained owner of the equipment but shifted the property rights and obligations tied to delivering equipment performance to HTI. Third, customers could opt to purchase services geared towards improving performance of their radiology department. Based on this arrangement, all property rights and obligations (other than the right to use a resource) are transferred to HTI. Table 5.3

provides an overview of the allocation of property rights and obligations and associated financial rewards and risks of HTI's service offering.

Table 5.3

Allocation property rights and obligations for service types

	Base services	Intermediate services	Advanced services
Right to			
Use a resource	Customer	Customer	Customer
Benefit financially from resource use	Customer	Customer	Manufacturer
Change form/substance of resource	Customer	Manufacturer	Manufacturer
Exclude others from resource use	Customer	Customer	Manufacturer
Alienate or transmit resource	Customer	Customer	Manufacturer
<i>Financial rewards manufacturer</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>
Obligation to			
Cover losses from resource use	Customer	Manufacturer	Manufacturer
Maintain resource	Customer	Manufacturer	Manufacturer
Dispose of resource at end of life	Customer	Customer	Manufacturer
<i>Financial risks manufacturer</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>

While property rights that HTI had acquired by offering intermediate and advanced services offered it the opportunity to reap financial rewards, associated obligations exposed HTI to financial risk if uptime guarantees (between 96 and 99 percent) were not met. “[W]hen you are in such kind of situation, what you need to ensure is the pure reliability of your system.

Because you are kind of ... [in a] turnkey deal also with your customer. So, your [profit] margin can be diminished by downtime” (HTI, Supplier Account Manager, 2016). This is because HTI had to cover maintenance costs (obligation to maintain resource) and financial penalties of up to 15 percent of the service fee, if uptime guarantees were not met (obligation to cover loss from resource use).

However, right after the introduction of intermediate services the effective financial risk exposure was limited. “We were not yet held responsible ... if they have downtime and we do not hit the 99 percent guarantee. ... So, we used to offer 99 percent uptime guarantee, customers did not mind, and they never wrote it down. What I see is they are becoming more demanding, so I think we will [be held accountable]” (HTI, Business Developer, 2016). Customers began to monitor performance of intermediate services and began to require compensation when agreed uptime targets were not met. This coincided with a legislative change that prohibited discounts to compensate for performance shortfalls. Since actual “reliability was around 95-96 percent” (HTI, Head of Global Marketing, 2017), financial risk tied to obligations had increased considerably.

5.4.3 Internal Alignment – Assigning Responsibility for Obligations to Business Functions

In internal alignment episodes, HTI sought to align the objectives of its business functions with its changed corporate objectives. That is, it sought to minimize financial risk associated with obligations that are tied to offering intermediate and advanced services. To illustrate that obligations tied to offering intermediate and advanced services changes objectives for business

functions we discuss an objectives change episode. This is followed by a discussion of a structure and process change episode to illustrate how changing objectives affected the internal organization of the manufacturer.

Objectives change episode (2016): Reliability of MRI becomes a core objective of business functions.

The increasing financial risk associated with offering advanced services drove the management team to evaluate whether changes to internal operations were needed. “There is now a development towards [uptime] contracts. The market pressure to offer [uptime] contracts is very high, which means that it is very important to arrange our internal operations properly such that we are not exposed to the [financial] risk [associated with these types of arrangements]” (HTI, Head of Global Marketing, 2017). For years, HTI had focused on developing the latest innovation to its customers, while at the same time reducing bill of material (BOM) cost. Due to the introduction of intermediate and advanced services, these objectives were no longer in line with obligations tied to the new service offering. Therefore, the corporate objectives had been reformulated to incorporate equipment reliability as a central goal of HTI. Translating this corporate objective to the business unit level, proved to be challenging, however. “That had a lot to do with the silos within HTI. And that they all had their own targets and KPIs to adhere to. So, and the weird thing is that, the net result is, that HTI as a whole of course suffers from [this lack of alignment in objectives]” (HTI, Manager Customer Excellence, 2016).

It had become apparent to the top management team that business unit objectives had to be adapted to deal with this new reality. “We have been too feature driven [in the past]. We need to think about customer needs when

developing solutions. We should think about the outcome so that solutions are exactly right” (HTI, Town Hall Meeting: Keynote Chief Executive Officer, 2017). To ensure that this new direction was implemented successfully, a change in objectives of business functions was required. Quality and reliability became core objectives for all business functions in 2016 in order to increase “system uptime and first-time right imaging while reducing cost of non-quality” (HTI, Strategic Priorities Document, 2017).

Structure change episode (2016): Reliability team created to improve reliability.

To coordinate quality and reliability initiatives among business functions, a reliability team was created. “The consequences for [HTI] of offering service contracts stay and fall with a system’s reliability. Service costs decrease with very reliable systems. This is why [HTI] started investing much more in the trustworthiness, of a system” (HTI, Product Manager, 2016). A core function of the reliability team was to assist business functions by providing them with information such that reliability targets could be achieved. “An important step to improve quality is the translation that needs to be made from marketing requirements to system requirements such that those can be translated to [Parts per million] (PPM) requirements” (HTI, Procurement Engineer, 2017). The reliability team played an important role in such translations and in institutionalizing “a totally different quality mindset” (HTI, Reliability Manager, 2018).

Process change episode (2016): Reliability models constructed to determine reliability at sub-system level.

To initiate improvements in reliability, a better understanding of the field performance of equipment was required. However, stress testing of MRI

equipment had been a challenge due to the prohibitive BOM costs of MRI equipment. “They are just too valuable. [MRI equipment costs at least 1 million euro.] ... So, it has been difficult to determine the actual reliability of our equipment” (HTI, Reliability Manager, 2017). Therefore, the reliability team had developed an alternative manner to determine equipment reliability. By utilizing field performance data collected by sensors integrated in MRI equipment, reliability models were constructed. Not only did these reliability models provide business functions with an understanding of field reliability, they also enabled the reliability team to establish which sub-systems were weak points as they decreased system reliability. Having the right to use sensor data thus became a central concern for the reliability team. “Of course, it is of importance to have access to the sensor data and that you analyze these data properly. That enables you to find root causes so that you can make adjustments and implement those in the field” (HTI, Reliability Manager, 2018). The output of reliability models therefore became an important input for processes across several business functions.

5.4.4 Supplier Alignment – Transferring Responsibility for Obligations to the Supply Base

In supplier alignment episodes, HTI’s procurement function sought to realign the objectives of its suppliers with its altered business function objectives. This critical episode is geared towards further minimizing the financial risk associated with the obligations tied to offering intermediate and advanced services. To illustrate the manner in which responsibilities for obligations are transferred to suppliers, we discuss an objectives change episode. This is followed by a discussion of a structure and process change episode to

illustrate how changing supplier objectives affected the manufacturer's interaction with its suppliers.

Objectives change episode (2016): Quality purchasing agreements implemented to formalize supplier objectives.

As business functions began to focus on improving equipment reliability, it became apparent that suppliers played a central role in reliability improvement. Given the initial focus on cost containment, contractual agreements created by HTI's purchasing function had previously focused on reducing BOM cost. "What I think that [HTI] has classically had a lot of attention for ... is the initial cost of components. ... over time, we want to decrease that BOM cost quite a bit. Uhm, what we also in some cases do pretty well and in others we forget it, is to put requirements to the supplier for the reliability. So, what kind of reliability do we expect from these parts? Well, sometimes, we just did not specify it" (HTI, Manager Customer Excellence, 2016). As business function objectives changed to incorporate reliability, not contractual agreements that specified quality and reliability requirements became a point of concern. "[I]nformation needs to move from downstream to upstream. That is move from the customer needs, what we have agreed with them through a contract, [the] same needs to be translated down the supply chain" (HTI, Business Developer, 2016). To realign supplier objectives with business function objectives, quality agreements were rolled out across the supply base. These contractual agreements specified minimum quality and reliability targets that had to be met by suppliers. "[W]hat became relevant in my agreement with my suppliers, is to ensure, uhm, minimum failure rate where the suppliers need to comply" (HTI, Supplier Account Manager, 2016). In addition, an overarching quality

policy was formulated as part of these agreements to communicate the importance of component quality to suppliers. The following paragraph is a section taken from the quality agreement template used by HTI's procurement function:

“With our hearts and minds we:

- delight our Customers and deliver our brand promise
- design and deliver safe, reliable, and effective products and services
- drive a culture of continuous improvement
- comply with applicable internal and external regulatory and compliance requirements
- maintain an effective and efficient quality management system” (HTI, Quality Agreement, 2018)

The implementation of quality purchasing agreements drove suppliers to increasingly focus on component quality. “We currently undertake efforts to change together with our customers toward providing better services to end-customers. One example is a recent effort to receive a certificate of complying with an ISO norm. In fact, the customer required us to obtain this ISO norm in order to continue our business relationship. We recognize the need for us to be part of the industry's change toward offering services. We will need to take on more responsibilities in the future” (Preferred Supplier, Chief Executive Officer, 2016).

Structure change episode (2016): Supplier quality improvement team added to improve production processes.

Due to the considerable shift in supplier requirements, several suppliers were faced with challenges to meet targets specified in quality agreements. Consequently, HTI created a supplier quality improvement team to assist suppliers in achieving quality and reliability targets. “What we generally do is have a lot of, dedicated teams ... that regularly visit suppliers. For example, ... we have supplier development team. That can go to suppliers, if for example the quality concern is, is seen after an audit, or if we think the supplier has productivity issues. Then they really can go to the suppliers ... they look at the production, and ... try to help them really improve [their production processes]” (HTI, Cost Manager, 2018).

Process change episode (2016): Supplier quality review process formalized through implementation of quality monitoring system.

An additional challenge faced by HTI concerned the sharing of component performance information with suppliers. After having implemented the quality purchasing agreements it became of considerable importance to share such information. “Obtaining information about what is happening in our customer’s markets is not easy. ... This is partly because there is no single point of contact to share information. Information is shared on an ad-hoc basis between employees” (Preferred Supplier, Chief Executive Officer, 2016). Obtaining information on field reliability of components was of considerable importance to suppliers for two reasons. First, “[t]esting of components is a problem because suppliers are not able to do full testing with their specific component as they do not have access to the full MRI system. That is, parameters are provided by [HTI] against which the component is to

be tested but these parameters are not always accurate. That means that the component might meet the parameters but does not work properly as part of the system” (HTI, Manager Customer Excellence, 2017). Second, suppliers had little understanding of the reason for their component being replaced in the field as they were not able to analyze defective components. “We do not manage, uhm, return from field for warranty, we do not have reverse logistics” (HTI, Supplier Account Manager, 2016).

To address these issues the supplier quality review process was formalized by implementing a quality monitoring system. “Ensuring that suppliers perform as they should is done through yearly performance reviews. For those we measure different aspects among which quality. ... And certain boundaries exist beyond which we say that we no longer want to collaborate with suppliers. So, suppliers are very much aware that they need to deliver a certain quality, otherwise they will not be qualified to work with [HTI]” (HTI, Cost Manager, 2016). When supplier account managers constituted that quality and reliability targets were not met, suppliers were asked to take corrective actions and eliminate the issue within 30-60 days.

5.4.5 Episode Sequences

To gain a better understanding of the dynamic evolution of supply chain alignment, we analyzed sequences of alignment episode types. While customer, internal and supplier alignment largely take place in parallel, these alignment episode types occur in distinct sequences. Customer alignment initiates the overall supply chain alignment process as rights and obligations are acquired by a manufacturer through the offering of intermediate and advanced services. Particularly the obligation to ‘cover losses from resource

use' and 'maintain resource' play a central role in determining the sequences of alignment episode types. Acquiring these obligations exposed HTI to considerable financial risk for two reasons. First, a part of its compensation had been tied to the availability of imaging equipment. Second, all costs related to delivering agreed upon availability of imaging equipment such as maintenance and replacement cost had to be covered by HTI. It is through financial risk that the acquired obligations acted as a 'trigger' of internal and supplier alignment. As HTI went through these alignment episodes it became clear that the right to 'use sensor data' acted as a 'facilitator' in initiating supplier alignment. That is, the right to use sensor data became imperative to the understanding of component performance in the field. These insights enabled HTI to identify suppliers that acted as culprits in system reliability issues. This in turn led to targeted improvement initiatives with suppliers.

What we have not touched upon in previous sections is how internal and supplier alignment fed back into customer alignment. Since the marketing function had started offering advanced services based on market demands, there initially was little understanding of the role that customers played in the financial risk that HTI became exposed to. As internal and supplier alignment occurred, this understanding increased and led to three distinct changes through customer alignment episodes. First, realizing that customer actions were an important determinant of equipment performance, the marketing function began to specify customer responsibilities in operating imaging equipment. The following section was added to the intermediate and advanced services contracts to minimize negative impact of customer actions on equipment performance.

“During the term of agreement, Customer will (HTI advanced services contract, 2017):

- Attend a start-up meeting at Customer’s facility, prior to the Effective Date of this Agreement, so [HTI] can explain the Services to the Customer’s management and selected staff
- Provide [HTI] at each System Site, at all times during the term of this Agreement, a dedicated broadband Internet access node.
- Maintain operating environment within [HTI] specifications for the Site (including temperature and humidity control, incoming power quality incoming water quality and fire protection system)
- Use the System in accordance with the published manufacturer’s operating instructions”.

Second, customers were involved more extensively in the maintenance of the imaging equipment. “[R]eliability improvements do not only regard the hardware but also services. Customers can facilitate this themselves by engaging in self-service, report problems more clearly, and such” (HTI business developer, 2016). And solutions were developed to improve customer involvement. “We have solutions – for example [HTI] e-alert – that is another one that we just launched. It is a solution where we e-mail the customer or SMS, they can choose, whenever something is wrong with their [system], with the environment around their system. So that they can take action. For example, a customer is, eh, responsible to take care of the power, humidity, and temperature around their system. If that is wrong, it could have a negative impact on the MR system and cause downtime” (HTI business developer, 2016).

Third, as the business functions had recognized the importance of the right to use field performance data in optimizing maintenance processes, the marketing function adjusted pricing such that a risk premium had to be paid by customers if the right to use field performance data was not transferred to HTI. “We are working on a [pricing] model based on which we tell the customer: if you do not want to connect your imaging equipment, that will result in a higher service fee” (HTI reliability manager, 2018). Through these three customer alignment episodes HTI sought to further decrease the financial risk that it was exposed to.

The overall supply chain alignment process consisting of the described episodic sequences is shown in Figure 5.2 and summarized in Appendix F. It becomes evident that property rights and obligations play a central role in these episode sequences and the overall supply chain alignment process.

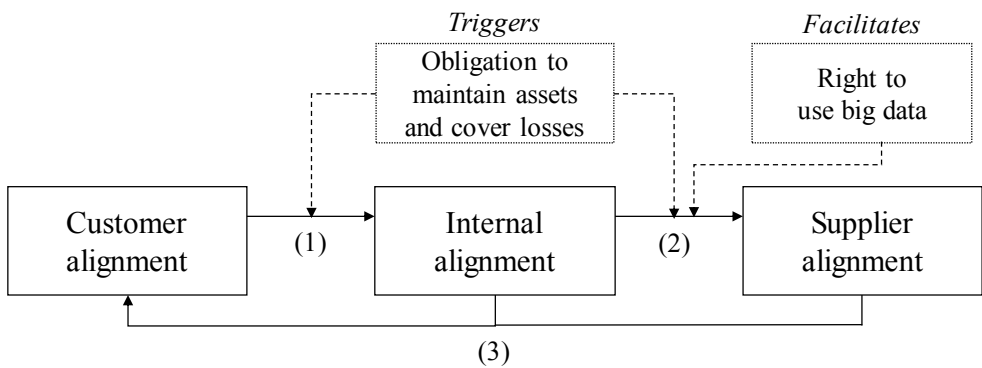


Fig. 5.2. Supply chain alignment process: episode sequences.

It is important to note that these sequences occurred several times as we studied this case. The observed episode sequences were initiated the first

time when HTI introduced intermediate services. And a second time when HTI introduced advanced services, since the introduction of this type of advanced services further increased financial risk.

5.5 DISCUSSION

As changes in competitive environments drive organizations that purchase equipment to adjust their corporate objectives, so do their requirements towards equipment manufacturers (Cusumano et al., 2015). An increasing number of organizations moves away from purchasing equipment outright, to purchasing equipment performance in the form of advanced services (Visnjic and Van Looy, 2013). Our longitudinal research reveals that when equipment manufacturers shift towards servitization, an alignment process is triggered that has far-reaching implications for supply-chain-wide operations. We find that property rights and obligations (and associated financial rewards and risks) tied to servitization, are important determinants of the manner in which this supply chain alignment process unfolds (Alghisi and Saccani, 2015). While the prospect to appropriate financial rewards from property rights initiates the supply chain process, obligations tied to offering intermediate and advanced services (Baines and Lightfoot, 2013) trigger further stages of supply chain realignment. Based on these insights we formulate the following proposition:

Proposition 1. The reallocation of property rights and obligations associated with servitization triggers a process of supply chain realignment.

We find that the supply chain alignment process takes place in three main alignment episodes in which objectives, incentives and operations process are realigned: customer alignment (between customers and equipment manufacturers), internal alignment (among manufacturers' business functions) and supplier alignment (between manufacturers and their suppliers) (Alghisi and Saccani, 2015). We find that a supply chain alignment process is initiated as a response to changing customer requirements (Cusumano et al., 2015). During customer alignment episodes that follow, manufacturers engage in servitization to realign their product and service offering with customer requirements (Baines et al., 2017; Baines and Lightfoot, 2013). By adding intermediate and advanced services to their portfolio, manufacturers are able to deliver the equipment performance that is sought by their customers. We find that it is the potential to appropriate additional financial rewards, through acquiring specific property rights (Coase, 1960; Kim and Mahoney, 2005), that drives manufacturers to engage in servitization. More specifically, when customers decide to purchase advanced services, they surrender the rights to 'benefit financially from resource use', 'change form/substance of resource', 'exclude others from resource use' and 'alienate or transmit resource' to manufacturers. The acquisition of these property rights provides manufacturers with far more control over equipment when compared to basic services. Most importantly, it grants manufacturers the exclusive right to maintain equipment, which means that these property rights provide manufacturers with the opportunity to appropriate additional rewards from the exchange.

While reliability shortcomings have little negative impact on manufacturers' bottom line when offering basic services, equipment

reliability is a key determinant of the financial rewards that can be extracted when offering advanced services (Baines and Lightfoot, 2013). This is the case because poor reliability leads to considerable expenditures for manufacturers. Not only do manufacturers need to pay fines to their customers when agreed upon reliability targets are not met, manufacturers also need to cover all costs resulting from the maintenance activities required to service equipment. We find that the resulting financial risk makes that quality and reliability of equipment become central corporate objectives for manufacturers. Therefore, we propose that:

Proposition 1a. Changing customer demands and the opportunity to appropriate additional financial rewards through a reallocation of property rights drive equipment manufacturers to engage in servitization to realign their corporate objectives with the objectives of their customers.

By studying alignment of objectives, incentives and operations processes as manufacturers engage in servitization, we show that obligations tied to servitization (and associated financial risks) trigger internal alignment episodes. Such internal alignment episodes lead to operational changes in business functions, targeted at increasing quality and reliability of equipment (Alghisi and Saccani, 2015). We find that internal alignment takes place at three levels: objectives, structure and processes. As quality and reliability of equipment become core objectives at the corporate level, these are translated to the business function level. Subsequently, to attain targets tied to these objectives business functions begin to realign their structure and processes

with these objectives (Oliva and Watson, 2010). For example, we show that a reliability team is created (structure) that creates reliability models to feed other business functions with information on component reliability (process). These insights lead us to formulate the following proposition:

Proposition 1b. The reallocation of obligations (and associated financial risks) tied to servitization drives equipment manufacturers to realign the objectives, structures and processes of their business functions with their changing corporate objectives.

We show that, as manufacturers' business functions are confronted with changing objectives, they seek to realign the objectives of component suppliers with their business function objectives (Petersen et al., 2005). To align supplier objectives with business level objectives, manufacturers' procurement functions adopt their contracting strategy by implementing quality agreements (Samson and Terziovski, 1999). Such agreements oblige manufacturers to deliver components meeting specified quality and reliability requirements. We find that this is followed by manufacturers procurement functions implementing a supplier quality review process to ensure that suppliers meet their obligations (process) (Carr and Pearson, 1999). And manufacturers seeking to develop their supply base towards achieving quality and reliability objectives, create a supplier quality improvement team (structure) (Modi and Mabert, 2007). Therefore, we propose that:

Proposition 1c. The reallocation of obligations (and associated financial risks) tied to servitization drives equipment manufacturers to realign the objectives of their suppliers with their changing business functions' objectives.

“For some, servitization is simply an information revolution” (Baines et al., 2017, p. 269). We find that information about equipment performance is imperative to achieve the most efficient allocation of property rights and obligations among supply chain actors (Porter and Heppelmann, 2015). This is because information about equipment performance acts as a main enabler of three alignment episodes through which manufacturers fulfil their obligations to customers (Opresnik and Taisch, 2015). First, information about equipment performance enables manufacturers' design teams to identify weaknesses in equipment design such that reliability can improved through design iterations. Second, manufacturers' service organizations can considerably improve efficiency of maintenance operations by having access to information about equipment performance (Kache and Seuring, 2017). Third, the procurement function of manufacturers can use information about equipment performance at the component level to identify suppliers that negatively affect equipment performance (Rai, Patnayakuni, and Seth, 2006). Taken together, all three alignment episodes enable manufacturers to increase the uptime of equipment considerably, which means that it enables them to meet their obligations tied to servitization.

However, given that equipment is located at customers' premises it had long been a challenge to acquire information about equipment performance. Recent technological developments have enabled

manufacturers to gain access to field performance data by adding sensors to their equipment (Kache and Seuring, 2017). We find that the right to access and use such performance field data is necessary to engage in the three identified alignment episodes. Therefore, this property right is a crucial enabler of the supply chain alignment process. Based on these insights we formulate the following proposition:

Proposition 2. The right to access and use performance field data of installed equipment facilitates the supply chain alignment process and is therefore necessary to achieve the most efficient allocation of property rights and obligations.

5.6 CONCLUSION

5.6.1 Theoretical Contributions

Our study makes four important contributions to servitization literature by introducing a new strand that focusses on equipment ownership and the implications of ownership rights on firm-level operations strategies, processes, and the management of supply chain relationships. First, our longitudinal study reveals that the structure of product ownership matters when it comes to alignment of objectives, incentives and operations processes across multiple supply chain tiers (Alghisi and Saccani, 2015; Oliva and Watson, 2011; Selviaridis and Spring, 2018). That is, the allocation of property rights and obligations (Coase, 1960; Kim and Mahoney, 2005) associated with basic services causes equipment manufacturers to have profoundly different objectives than does the allocation associated with intermediate and advanced services (Baines and Lightfoot, 2013). While

selling basic services incentivizes manufacturers to focus on cost containment, selling intermediate and advanced services incentivizes manufacturers to focus on quality and reliability of equipment. We find that these corporate objectives drive manufactures to adopt different operational strategies to align operations across the supply chain.

Second, our study shows exactly how ownerships matters: it reveals the mechanisms of alignment, and more importantly the specific processes by which alignment occurs both within the manufacturing firm (Oliva and Watson, 2011), but also between the manufacturing firm and its customers and suppliers (Selviaridis and Spring, 2018). We find that the opportunity to appropriate additional financial rewards through a reallocation of property rights drives equipment manufacturers to engage in servitization. At the same time, financial risks introduced by obligations tied to offering advanced services act as a mechanism that triggers internal alignment and supplier alignment episodes. These alignment episodes are particularly focused on optimizing operations and aligning objectives and incentives in order to increase the reliability of equipment. Manufacturers can derive some financial rewards by delivering subpar reliability when offering basic services, as customers will be interested in buying maintenance services (Baines and Lightfoot, 2013). However, when selling advanced services, subpar reliability exposes manufacturers to considerable financial risk since costs associated with maintaining equipment hurt their bottom line. This shift in responsibilities drives manufacturers to realign objectives and incentives of their business functions and their suppliers with adapted corporate objectives.

Third, we elaborate on a process view of supply chain alignment (see Selviaridis and Spring, 2018) by showing the sequence and interrelationships between manufacturing firm (internal) alignment, customer alignment and supplier alignment. We find that a distinct sequence of supply chain alignment episodes unfolds when manufacturers engage in servitization of their business. Offering advanced services triggers a customer alignment episode in which the manufacturer's corporate objectives are aligned with the objectives of their customers. To manage financial risk associated with obligations tied to advanced services, this is followed by internal alignment episodes. During these episodes, objectives, incentives, structures and operational processes of business functions are realigned with corporate objectives. As many manufacturers nowadays rely heavily on their suppliers (Van Weele and Van Raaij, 2014), internal alignment episodes are followed by supplier alignment episodes during which objectives and incentives of suppliers are aligned with manufacturers' corporate objectives.

Fourth, we make an empirical contribution by analyzing how issues concerning ownership of data (e.g., product usage data) influence the partitioning of property rights in relation to the product itself, and the allocation of associated risks and rewards between supply chain counterparts. Ownership of data has hitherto received little attention in OM literature and property rights literature (Foss and Saebi, 2017; Walker et al., 2015). However, our study reveals that the right to use performance field data facilitates the supply chain alignment process. That is, acquiring the right to use performance field data enables manufacturers to optimize supply-chain-wide operations. More specifically, through utilizing field performance data manufacturers can implement predictive and preventive maintenance

operations (Ostrom et al., 2015; Porter and Heppelmann, 2015). This considerably increases control over performance of equipment located at customer facilities and thereby increases uptime of equipment while at the same time decreasing maintenance cost (Opresnik and Taisch, 2015). In addition, manufacturers can determine which components cause reliability issues. Consequently, specific suppliers can be targeted with more stringent quality requirements and if necessary, manufacturers can assist such suppliers in improving their quality assurance processes (Modi and Mabert, 2007).

5.6.2 Managerial Contributions

Based on our study we can offer several practical recommendations for manufacturing firms adopting servitization. Our study illuminates the mechanisms through which servitization can bring value to all supply chain parties. By engaging in servitization, manufacturers can extract additional financial rewards from their product offering, while at the same time delivering superior performance to their customers. However, to reap the rewards of servitization, manufactures need to undergo a considerable change process to optimize operations such that obligations tied to service-based business models can be met. First, these obligations need to be assigned to business functions by adopting relevant performance objectives throughout the organization. That is, system reliability should become a core objective for all business functions. Second, these obligations need to be (partly) transferred to the manufacturer's supply base by designing contractual agreements that formalize reliability and quality requirements. Subsequently, performance management processes need to be implemented,

to ensure that suppliers adhere to the formulated requirements. Where necessary, suppliers need to be assisted in improving their operations such that reliability and quality targets can be met. Third, requirements to be adhered to by customers need to be formalized to clearly define obligations between customers and manufacturers. This is crucial to ensure that manufacturers are not made responsible for system reliability issues that are caused by counterproductive customer behavior, such as improper use of the system or inappropriate environmental conditions. By increasing supply chain alignment through these operational changes, financial rewards that can be extracted through servitization can be maximized.

Paradoxically, by adopting servitization manufacturing firms are driven to optimize their operations towards delivering highly reliable products. While the outcomes of this change process initially benefit manufacturing firms' bottom lines, over time it reduces the financial rewards that can be appropriated from servitized offerings. More specifically, when products become more reliable, advanced services (particularly maintenance services) become of less relevance as products require less maintenance over time. Thus, as the extent of supply chain alignment increases, the allocation of property rights and obligations becomes less efficient from a supply perspective. It is therefore of importance that manufacturing firms offering advanced services provide value to customers beyond maintenance services to sustain the business model over time.

5.6.3 Limitations and Future Research Directions

Our study of supply chain alignment in the context of servitization is only a starting point of this literature stream. We develop several testable

propositions that will require further investigation. More research is needed to develop an in-depth understanding of the manner in which organizations can align supply-chain-wide operations. For example, future studies could investigate the most effective manner to align objectives, incentives and operations processes across the supply chain based on a design science approach (Van Aken, Chandrasekaran, and Halman, 2016). During the time of data collection, the organization that we studied was confronted with three main design challenges. First, the organization faced challenges in determining with payment method (e.g., output-based and outcome-based) would be most effective to achieve customer alignment and superior in extracting financial rewards. Second, the organization faced challenges in aligning interests of business functions, which resulted in suboptimal collaboration as business functions acted as silos (Oliva and Watson, 2010). Third, considerable challenges arose in realigning objectives and incentives of suppliers. To enforce quality agreements, the manufacturer's procurement function filed financial claims against suppliers. This resulted in a deterioration of the buyer-supplier relationships. Future research could develop design propositions to inform organizations about the most effective operations strategies to address these challenges.

We used interviews as the primary method of data collection to capture the supply chain alignment process over time. Since conducting interviews at intermediate points in time would limit our understanding of messy day-to-day interactions between supply chain actors, we complemented this form of data collection with non-participant observation. This provided us with detailed insights concerning changes in day-to-day interactions between supply chain actors. However, as we were unable to

trace events real-time for the first four and a half years under study, we had to rely on interviewees' retrospective accounts of events. As this limitation may decrease the accuracy and completeness of our interview data, we complemented these accounts with various company documents and news articles. These rich and varied data sources enabled us to verify and complement retrospective accounts of events through triangulation. Nonetheless, future studies could rely more extensively on ethnographic methods to reveal team and individual level alignment of objectives, incentives and operations processes (see Pagell and LePine, 2002).

Finally, due to fact that our findings are based on a single case study, the generalizability of our findings is arguably limited. While our strong theoretical grounding and embedding of findings in extant literature leads us to believe that the core insights of our study are applicable to a wide range of manufacturers, further research is needed to explore the boundary conditions of our model. Scholars could study the same phenomenon in supply chains other than the healthcare sector to establish whether supply chain alignment is affected by industry specific factors. Further, future studies could investigate whether country specific factors such as culture affect supply chain alignment practices.

CHAPTER 6

GENERAL DISCUSSION AND CONCLUSION

6.1 DISCUSSION AND CONCLUSION

While outsourcing of services has generally strengthened the customer value proposition of organizations (Maglio and Spohrer, 2008), it has presented organizations with challenges in terms of how to manage outsourcing relationships (Modi, Wiles, and Mishra, 2015). Academic literature has proposed the use of performance-based contracting (PBC) as a tool to address challenges related to opportunistic actions of suppliers (Jensen and Meckling 1976; Ouchi, 1979). In her seminal article, Eisenhardt (1989a) reviewed extant agency theory literature to develop a framework that explicates the relationships between characteristics of contracted tasks and the effectiveness of PBC in mitigating opportunism. The insights captured in this framework have assisted buyers in deciding for which types of services PBC should be used. However, continued misapplication of PBC by buyers (e.g., Ng and Nudurupati, 2010; Ssengooba, McPake, and Palmer, 2012) has raised questions as to whether agency theoretic ideas (Jensen and Meckling, 1976) and extant literature grounded in these ideas could be ignoring critical aspects of outsourcing relationships. To develop more fine-grained knowledge about the application of PBC in outsourcing relationships, this dissertation had two primary objectives: (a) to investigate how buying organizations can effectively contract uncertain performance outcomes that pose a considerable financial risk to suppliers, and (b) to investigate how suppliers can minimize the financial risk associated with selling uncertain performance outcomes.

To achieve these objectives, the studies in this dissertation investigate practices during two distinct phases of the contracting process: the contract design phase and the contract management phase (Brown and Potoski, 2003). Thereby, this dissertation moves beyond the prevailing (albeit implicit) approach in contracting literature, to focus primarily on the contract design phase (e.g., Argyres and Mayer, 2007). By focusing on the contract design phase, extant literature has studied the role that contracts play in incentivizing suppliers to act in line with buyer interests (Jensen and Meckling, 1967). What has received little attention, is how buyer and supplier actions can influence the effectiveness of contractual incentives during the contract management phase (Selviaridis and Norrman, 2014). Contracting literature provides no clear reasoning as to why this neglect has been commonplace. We posit that there are two main aspects that have led extant literature to predominantly focus on contract design. First, studies grounded in grand theories such as agency theory and transaction cost economics have approached contracting from a strategic perspective (e.g., Harmon, Kim and Mayer, 2015; Lumineau and Malhotra, 2011). The most dominant literature streams focus for instance on how different types of contracts affect trust in inter-organizational relationships. Due to the strategic perspective that scholars have adopted on contracting, operational processes that take place after the contract has been implemented have largely been ignored. That is, contract design has received extensive attention, whereas contract management has not. Second, contracting scholars have faced challenges in operationalizing and measuring contract management practices. When one studies contracting literature it becomes apparent that constructs have been measured at the contract level. Measurement is carried out by either

analyzing contractual clauses or by conducting surveys among managers, in which respondents are asked to characterize contracts on defined measurement scales. Few previous studies have attempted to operationalize and measure constructs capturing contract management practices. We believe that the complex nature of contract management practices has acted as barrier for data collection about this phase of the contracting process. In this dissertation we have sought to overcome these challenges to move beyond the focus on contract design. Focusing on practices during the contract design and contract management phases has resulted in the following theoretical advancements.

First, this approach has enabled us to study whether buyers should combine PBC and BBC during the identified contracting phases (Carson, 2007), to mitigate opportunistic supplier behavior (Ross, 1973; Wang and Yang, 2013). Traditional theories on contracting such as agency theory (Eisenhardt, 1989) and theories on organizational control (Ouchi, 1979) suggest that PBC will not be effective in contracting services characterized by outcome uncertainty, and that in such situations behavior-based contracting (BBC) will be more effective in achieving satisfactory performance outcomes. However, contemporary studies have revealed that PBC and BBC act as complements rather than substitutes (Nielsen et al., 2018; Sihag and Rijdsdijk, 2018). By building on these insights, we established whether PBC and BBC should be combined during the contract design and contract management phases. While we found no evidence that combining PBC and BBC during the contract design phase mitigates opportunistic supplier behavior, our results reveal that combining these contracting approaches during the contract management phase can mitigate

such behavior (for a more detailed discussion see Chapter 2). This finding indicates that monitoring and evaluation activities, carried out during the contract management phase, are an important mechanism by which buyers can mitigate unwanted supplier behavior (Van der Valk and Iwaarden, 2011). Moreover, these findings reveal that contract management practices should receive more attention in academic literature since they play an important role in services contracting.

Second, moving beyond focusing solely on the contract design phase has enabled us to adopt a more dynamic view on contracting in three ways. First, Eisenhardt's (1989) framework (see Table 1.1) provides useful insights in the effectiveness of PBC and BBC in relation to several task characteristics. However, one implicit assumption, which this framework is based on, is that task characteristics are constant during a contracting period. While this assumption simplifies the selection of contractual controls during the contract design phase, our studies reveal that task characteristics can change considerably during the contract management phase. Take for example outcome uncertainty. Our studies reveal that buyers can fulfill a wide range of roles through which they interact with the supplier during the service production process. Through the fulfillment of some roles, buyers provided suppliers with crucial inputs that are needed to produce the service. Fulfilling such roles in an ineffective manner can considerably increase the level of outcome uncertainty that a supplier is faced with. At the same time, buyers can attenuate the relationship between inadequate role fulfillment and outcome uncertainty, by engaging in contract management activities. By altering their actions buyers can thus decrease or increase outcome uncertainty significantly (for a more detailed discussion see Chapter 3).

Thus, PBC can become more or less effective based on changes that occur during the contract management phase. These insights reveal that a more dynamic view on PBC effectiveness in relation to the task characteristics identified by Eisenhardt (1989) should be adopted. Second, when studying behavioral consequences of incentives, contracting literature grounded in agency theory (Jensen and Meckling, 1976) has adopted a static view. Take for example a service contract that lasts five years. Previous studies would have investigated how a supplier responds when faced with outcome uncertainty during either of these five years. What such studies ignored, is how success or failure during a previous year (year 1) affects supplier behavior in a subsequent year (year 2). Building on Weiner's (1989) work we find that supplier behavior in year 2 is affected by emotions that are triggered by the success or failure a supplier had been confronted with in year 1 (for a more detailed discussion see Chapter 4). Consequently, when behavioral consequences of incentives are studied it is important to adopt a dynamic view on contracting based on past and current events. Third, the static view on contracting by literature grounded in agency theory (Jensen and Meckling, 1976) is based on the assumption that contracts are complete. Property rights theory (Coase, 1960) presents arguments against this assumption that are rooted in the insight that buyers cannot foresee all contingencies during the contract design phase (Kim and Mahoney, 2005). Alchian (1965) and Coase (1960) argue that organizations reallocate property rights to deal with unforeseen contingencies. Building on this insight we study how the selling of performance outcomes reallocates property rights among supply chain actors, and how such reallocations initiate operational changes. We find that a dynamic process occurs through which financial risks

and rewards are reallocated across supply chain actors (for a more detailed discussion see Chapter 5). The findings show that the opportunity to appropriate additional financial rewards through a reallocation of property rights drives first tier suppliers to sell performance outcomes. At the same time, financial risks introduced by obligations tied to offering such services act as a mechanism that triggers alignment of responsibilities between buyers, first tier suppliers, and second tier suppliers. Such alignment is particularly focused on optimizing operations and aligning objectives and incentives in order to improve performance outcomes.

Overall, the theoretical advancements presented in this dissertation provide us with a better understanding of how to contract and sell uncertain performance outcomes in an effective manner. The following sections discuss the managerial implications of the findings discussed in this dissertation and the limitations and directions for future research.

6.2 MANAGERIAL CONTRIBUTIONS

The findings presented in this dissertation offer important insights for two types of supply chain actors: buyers of performance outcomes and suppliers of performance outcomes.

The presented findings have three main implications for buyers of performance outcomes. First, our studies reveal that buyers of performance outcomes should allocate adequate resources to the contract management phase. During this contracting phase contractual controls take effect and their adequate use is pertinent to successful outsourcing of services. This insight might appear rather unsurprising: Why would an organization award a contract and subsequently not verify whether obligations specified in the

contract are met by a supplier? Our studies reveal that there are two main challenges in executing contract management activities. First, organizations are faced with challenges in assigning responsibility for contract management activities to relevant business functions. Contract design is a core task for the purchasing function, which means that the responsibility for this phase of the contracting process is naturally assigned to this business function. On the other hand, responsibility to carry out contract management activities can be assumed by the purchasing function, the business function that consumes the good/service, or a combination thereof. Second, carrying out contract management activities requires access to supplier performance data. Given that the purchasing function contracts the supplier, but that the goods/services are delivered to another business function (or third party), a structured process needs to be put in place to collect supplier performance data.

That is not to suggest that managers should ignore the contract design phase. While our studies provide no evidence that contractual controls specified during the contract design phase mitigate problems during outsourcing relationships, this contracting phase is of importance to reach a clear allocation of responsibilities between supply chain parties. However, engaging in monitoring and evaluation activities during the contract management phase are critical to reap rewards of the agreed upon contract.

Second, the findings of this dissertation suggest that buyers of performance outcomes should combine the contractual controls that underlie PBC and BBC. Combining contractual controls enables managers to motivate suppliers to achieve the desired outcomes, while at the same time engaging them in constructive discussion on how future outcomes can be

improved. When selecting appropriate contractual controls to contract uncertain performance outcomes, it is of importance to strike a right balance between PBC and BBC. Our findings reveal that managers should primarily focus on exercising performance-based controls. When combining performance-based controls with some basic behavior-based controls, the use of controls mitigates problems with supplier behavior. However, combining performance-based controls with extensive use of behavior-based controls, is found to be counterproductive. The latter restricts suppliers' freedom to optimize their operations, which means that financial risks cannot be effectively managed.

Third, the findings presented in this dissertation suggest that actions of buyers that interfere with the service production process can be detrimental to the effectiveness of PBC. Such actions can considerably increase the risk that suppliers will not be compensated for their efforts. Consequently, if such buyer actions are undertaken in an inefficient manner, they can drive suppliers to engage in adverse behavior. Buyers should be aware of the roles that they fulfill in a service production process. For any role that restricts the supplier's freedom to optimize its operations it is imperative to reconsider whether it is necessary for the buyer to fulfill the role. If role fulfillment is deemed necessary, utmost care needs to be exercised to optimize the process through which the role is fulfilled. In addition, buyers can engage in monitoring of performance and behavior to establish why performance shortfalls have occurred and how the causes thereof can be alleviated.

The findings of this dissertation have three main implications for suppliers of performance outcomes. First, the findings reveal that suppliers

should investigate to which extent performance outcomes are under their control, before they agree to deliver certain performance outcomes. The less performance outcomes are under the control of suppliers, the higher the financial risk that suppliers are exposed to. Therefore, it is of importance to assess the financial risk tied to delivering specific performance outcomes to determine whether the project is financially viable. If the project is deemed financially viable, our findings suggest that suppliers should engage in constructive discussion with buyers to determine the extent of the involvement of the buyer in the service production process. By creating awareness of the roles that buyers and suppliers play in creating the service, each party can optimize their operations in coordination with one another.

Second, findings presented in this dissertation suggest that considerable operational changes throughout the supply chain are needed when suppliers transition to selling performance outcomes. Suppliers need to initiate internal changes and make their suppliers (partly) responsible for performance outcomes. Through internal changes, business functions need to be made responsible for obligations tied to selling performance outcomes. This can be done by adopting relevant performance objectives throughout the organization. At the same time, second tier suppliers need to be made responsible for obligations tied to selling performance outcomes. This can be done by designing contractual agreements that for instance formalize reliability and quality requirements of components. Subsequently, performance management processes need to be implemented, to ensure that second tier suppliers adhere to the formulated requirements.

6.3 LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

While each study in this dissertation discusses its own limitations, the findings of this dissertation should also be viewed in the light of the following limitations. First, the cross-sectional nature of the data used in Study 1 (Chapter 2) and the fact that single informants were used prevents us from making strong causal claims (Ketokivi and McIntosh, 2017). We have sought to address this limitation by using qualitative methods in Study 2 (Chapter 3) and experimental methods in Study 3 (Chapter 4) to gain a better understanding of the causal mechanisms underlying the findings presented in study 1. Particularly the experimental methods used in Study 3 strengthens our conviction that the results of Study 1 are not negatively affected by endogeneity issues. More specifically, through the experimental design used in study 3, causal relationships between outcome uncertainty inducing factors and supplier behavior could be tested. Second, there are some limitations for each of the four studies concerning the empirical context. All four studies were conducted in Western Europe, which means that the findings might be specific to Western European culture. While Western cultures typically rely more on contractual controls, (some) Eastern cultures rely more on trust building. This could limit the generalization of the findings to other cultural regions could be limited. We have sought to improve generalizability of the findings beyond the Western European context by grounding each study in established theories and topic specific literature. Third, since the level of analysis of Study 1 and Study 2 is the organizational level, these studies could have ignored important aspects that occur at the

departmental, team or individual level. We have sought to address this limitation by conducting Study 3 at the individual level. We found that emotions experienced by individuals and individual differences play an important role in relationships studied in Study 1 and Study 2. Therefore, we would encourage scholars to conduct further studies at the departmental, team and individual level to study whether factors specific to these levels have been ignored by previous studies.

In addition to addressing the aforementioned limitations, future research can also explore the following research areas. First, future research could investigate how the use of big data can foster the use of PBC. In our fourth study (Chapter 5) we find that equipment performance data derived from sensors (Internet of Things technology) acts an important facilitator for supplier alignment. Both buyers and suppliers can benefit from this technology. Buyers can monitor real-time whether suppliers deliver performance outcomes in accordance with specified performance targets. Therefore, the use of this technology can considerably increase outcome measurability and should be able to improve coordination efforts between buyers and suppliers. A big question, however, remains how the right to use such data should be allocated among supply chain actors. The exact implications of the use of this technology in combination with PBC warrant further investigation. Second, we believe that adopting behavioral theories can lead to considerable advancements in the field of contracting. Our third study (Chapter 4) reveals that by ignoring behavioral consequences of emotions and cognitive biases contracting literature has reached empirically invalid conclusions. More specifically, contracting literature had assumed that any factor that increases outcome uncertainty, will have negative

behavioral consequences. Our findings reveal that this not the case, since behavioral consequences are (in part) determined by emotions and not rational decision making. We would like to stimulate scholars to broaden their theoretical toolkit by incorporating behavioral theories to critically evaluate behavioral assumptions underlying their conclusions. Third, we believe that the new literature strand concerning implications of ownership rights on firm-level operations strategies, processes, and the management of supply chain relationships that we have introduced in Study 4 (Chapter 5) can make significant contributions to servitization literature. Investigating implications of ownership provides future studies with a promising avenue to future research. More specifically, servitization literature has often been criticized for lacking theoretical grounding. We would like to encourage scholars to ground their work in property rights theory since it provides a well theorized foundation for servitization studies.

REFERENCES

- Abramson, L. Y., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology*, 87, 49-74.
- Adida, E., & Bravo, F. (2018). Contracts for healthcare referral services: Coordination via outcome-based penalty contracts. *Management Science*, 65, 1322-1341.
- Aiken, M., & Hage, J. (1966). Organizational alienation: A comparative analysis. *American Sociological Review*, 31, 497-507.
- Akkermans, H., & Vos, B. (2003). Amplification in service supply chains: An exploratory case study from the telecom industry. *Production and Operations Management*, 12, 204-223.
- Alchian, A. A. (1965). Some economics of property rights. *Il politico*, 816-829.
- Alghisi, A., & Saccani, N. (2015). Internal and external alignment in the servitization journey – overcoming the challenges. *Production Planning & Control*, 26, 1219–1232.
- Anderson, E., & Oliver, R. L. (1987). Perspectives on behavior-based versus outcome-based salesforce control systems. *Journal of Marketing*, 51, 76-88.
- Ang, G., Groosman, M., & Scholten, N. P. M. (2005). Dutch performance-based approach to building regulations and public procurement. *Building Research and Information*, 33, 107–119.
- Antia, K. D., & Frazier, G. L. (2001). The severity of contract enforcement in interfirm channel relationships. *Journal of Marketing*, 65, 67–81.
- Argyres, N., & Mayer, K. J. (2007). Contract design as a firm capability: An integration of learning and transaction cost perspectives. *Academy of Management Review*, 32, 1060-1077.
- Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail Surveys. *Journal of Marketing Research*, 14, 396-402.
- Atinc, G., Simmering, M. J., & Kroll, M.J. (2012). Control variable use and reporting in macro and micro management research. *Organizational Research Methods*, 15, 57-74.

- Banker, R. D., Lee, S. Y., Potter, G., & Srinivasan, D. (1996). Contextual analysis of performance impacts of outcome-based incentive compensation. *Academy of Management Journal*, 39, 920-948.
- Bachrach, D. G., & Bendoly, E. (2011). Rigor in behavioral experiments: A basic primer for supply chain management researchers. *Journal of Supply Chain Management*, 47, 5-8.
- Baines, T., Lightfoot, H., & Smart, P. (2011). Servitization within manufacturing. *Journal of Manufacturing Technology Management*, 22, 947-954.
- Baines, T., & Shi, V. G. (2015). A Delphi study to explore the adoption of servitization in UK companies. *Production Planning & Control*, 26, 1171-1187.
- Baines, T., & Lightfoot, H. W. (2013). Servitization of the manufacturing firm. *International Journal of Operations & Production Management*, 34, 2-35.
- Baines, T., Ziaee Bigdeli, A., Bustinza, O. F., Shi, V. G., Baldwin, J., & Ridgway, K. (2017). Servitization: revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, 37, 256-278.
- Barratt, M., & Barratt, R. (2011). Exploring internal and external supply chain linkages: Evidence from the field. *Journal of Operations Management*, 29, 514-528.
- Barratt, M., Choi, T. Y., & Li, M. (2011). Qualitative case studies in operations management: Trends, research outcomes, and future research implications. *Journal of Operations Management*, 29, 329-342.
- Bastl, M., Johnson, M., Lightfoot, H., & Evans, S. (2012). Buyer-supplier relationships in a servitized environment. *International Journal of Operations & Production Management*, 32, 650-675.
- Bastl, M., Johnson, M., & Finne, M. (2019). A Mid-range theory of control and coordination in service triads. *Journal of Supply Chain Management*, 55, 21-47.
- Beer, M., Eisenstat, R., & Spector, B. A. (1990). *The critical path to corporate renewal*. Cambridge: Harvard University Press.

- Bello, D. C., & Gilliland, D. I. (1997). The effect of output controls, process controls, and flexibility on export channel performance. *Journal of Marketing*, 61, 22-38.
- Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The Case Research Strategy in Studies of Information Systems. *MIS Quarterly*, 11, 369-386.
- Bendoly, E., Donohue, K., & Schultz, K. (2006). Behavioral operations management: assessing recent findings and revisiting old assumptions. *Journal of Operations Management*, 24, 737-752.
- Berends, H., Van Burg, E., & Van Raaij, E. M. (2011). Contacts and Contracts: Cross-Level Network Dynamics in the Development of an Aircraft Material. *Organization Science*, 22, 940-960.
- Bergen, M., Dutta, S., & Walker Jr, O. C. (1992). Agency relationships in marketing: A review of the implications and applications of agency and related theories. *Journal of Marketing*, 56, 1-24.
- Beuren, F. H., Gomes Ferreira, M. G., & Cauchick Miguel, P. A. (2013). Product-service systems: a literature review on integrated products and services. *Journal of Cleaner Production*, 47, 222-231.
- Beverland, M., & Lindgreen, A. (2010). What makes a good case study? A positivist review of qualitative case research published in industrial marketing management, 1971- 2006. *Industrial Marketing Management*, 39, 56-63.
- Blumer, H. (1954). What is wrong with social theory? *American Sociological Review*, 19, 3-10.
- Boyer, K. K., & McDermott, C. (1999). Strategic consensus in operations strategy. *Journal of Operations Management*, 17, 289-305.
- Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the Econometric Society*, 47, 1287-1294.
- Broekhuis, M., & Scholten, K. (2018). Purchasing in service triads: the influence of contracting on contract management. *International Journal of Operations & Production Management*, 38, 1188-1204
- Bonner, J. M., Ruekert, R. W., & Walker Jr, O. C. (2002). Upper management control of new product development projects and project

- performance. *Journal of Product Innovation Management*, 19, 233-245.
- Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. (2004). The concept of validity. *Psychological Review*, 111, 1061–1071.
- Brown, T. L., & Potoski, M. (2003). Contract-management capacity in municipal and county governments. *Public Administration Review*, 63, 153–164.
- Bryman, A., & Bell, E. (2007). *Business research methods*. London: Oxford University Press.
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: a new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6, 3-5.
- Cannon, J. P., Achrol, R. S., & Gundlach, G. T. (2000). Contracts, norms, and plural form governance. *Journal of the Academy of Marketing Science*, 28, 180-194.
- Cardinal, L. B., Kreutzer, M., & Miller, C. C. (2017). An Aspirational View of Organizational Control Research: Re-invigorating Empirical Work to Better Meet the Challenges of 21st Century Organizations. *Academy of Management Annals*, 11, 559-592.
- Carey, S., Lawson, B., & Krause, D. R. (2011). Social capital configuration, legal bonds and performance in buyer–supplier relationships. *Journal of Operations Management*, 29, 277-288.
- Carson, S. J. (2007). When to give up control of outsourced new product development. *Journal of Marketing*, 71, 49-66.
- Carr, A. S., & Pearson, J. N. (1999). Strategically managed buyer–supplier relationships and performance outcomes. *Journal of Operations Management*, 17, 497–519.
- Celly, K. S., & Frazier, G. L. (1996). Outcome-based and behaviour-based coordination efforts in channel relationships. *Journal of Marketing Research*, 33, 200-210.
- Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of formative measurement in information systems research. *MIS quarterly*, 33, 689-707.

- Challagalla, G. N., & Shervani, T. A. (1996). Dimensions and types of supervisory control: Effects on salesperson performance and satisfaction. *The Journal of Marketing*, 60, 89–105.
- Chase, R. B. (1978). Where does the customer fit in a service operation? *Harvard Business Review*, 56, 137–142.
- Chervonnaya, O. (2003). Customer role and skill trajectories in services. *International Journal of Service Industry Management*, 14, 347–363.
- Choudhury, V., & Sabherwal, R. (2003). Portfolios of control in outsourced software development projects. *Information Systems Research*, 14, 291–314.
- Coase, R. H. (1960). The Problem of Social Cost. *The Journal of Law and Economics*.
- Contractor, F. J., Kumar, V., & Kundu, S. K. (2007). Nature of the relationship between international expansion and performance: The case of emerging market firms. *Journal of World Business*, 42, 401–417.
- Cusumano, M. A., Kahl, S. J., & Suarez, F. F. (2015). Services, industry evolution, and the competitive strategies of product firms. *Strategic Management Journal*, 36, 559–575.
- Dasborough, M. T., & Ashkanasy, N. M. (2002). Emotion and attribution of intentionality in leader–member relationships. *The Leadership Quarterly*, 13, 615–634.
- Datta, P. P., & Roy, R. (2011). Operations strategy for the effective delivery of integrated industrial product-service offerings: two exploratory defence industry case studies. *International Journal of Operations & Production Management*, 31, 579–603.
- Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13, 727–756.
- De Jong, B. A., Bijlsma-Frankema, K. M., & Cardinal, L. B. (2014). Stronger than the sum of its parts? The performance implications of peer control combinations in teams. *Organization Science*, 25, 1703–1721.

- Dekker, H. C., & Van den Abbeele, A. (2010). Organizational learning and interfirm control: The effects of partner search and prior exchange experiences. *Organization Science*, 21, 1233-1250.
- Diamantopoulos, A., & Winklhofer, H. M. (2001). Index construction with formative indicators: an alternative to scale development. *Journal of Marketing Research*, 38, 269-277.
- Diamantopoulos, A., Riefler, P., & Roth, K. (2008). Advancing formative measurement models. *Journal of Business Research*, 61, 1203-1218.
- Dillman, D. A. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.). Wiley, New York.
- Dorn, M., & Ekström, T. (2014). Exploring service innovations in performance based contracts in the Swedish defence sector: A case study of SK 60 trainer. *Proceedings of the Eleventh Annual Acquisition Research Symposium*. Monterey: Naval Postgraduate School.
- Douglas, S. C., & Martinko, M. J. (2001). Exploring the role of individual differences in the prediction of workplace aggression. *Journal of Applied Psychology*, 86, 547-559.
- Dubois, A., & Araujo, L. (2004). Research methods in industrial marketing studies. In H. Håkansson, D. Harrison, & A. Waluszewski (Eds.), *Rethinking marketing: Developing a new understanding of markets* (pp. 207–228). Chichester: Wiley.
- Dubois, A., & Gadde, L. E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research*, 55, 553–560.
- DuHadway, S., Carnovale, S., & Kannan, V. R. (2018). Organizational Communication and Individual Behavior: Implications for Supply Chain Risk Management. *Journal of Supply Chain Management*, 54, 3-19.
- Duval, S., Duval, V. H., & Mayer, F. S. (2014). *Consistency and cognition: A theory of causal attribution*. New York: Psychology Press.
- Dyer, W. G., & Wilkins, A. L. (1991). Better Stories, Not Better Constructs, To Generate Better Theory: A Rejoinder to Eisenhardt. *Academy of Management Review*, 16, 613–619.

- Eberly, M. B., Holley, E. C., Johnson, M. D., & Mitchell, T. R. (2011). Beyond internal and external: A dyadic theory of relational attributions. *Academy of Management Review*, 36, 731-753.
- Eberly, M. B., Holley, E. C., Johnson, M. D., & Mitchell, T. R. (2017). It's Not Me, It's Not You, It's Us! An Empirical Examination of Relational Attributions. *Journal of Applied Psychology*, 102, 711-731.
- Edvardsson, B., & Olsson, J. (1996). Key Concepts for New Service Development. *The Service Industries Journal*, 16, 140-164.
- Eisenhardt, K.M. (1989a). Agency theory: An assessment and review. *Academy of Management Journal*, 14, 57-74.
- Eisenhardt, K. M. (1989b). Building theories from case study research. *Academy of Management Review*, 14, 532-550.
- Ellis, S. C., Shockley, J., & Henry, R. M. (2011). Making sense of supply disruption risk research: A conceptual framework grounded in enactment theory. *Journal of Supply Chain Management*, 47, 65-96.
- Ellram, L. M. (1996). The use of the case study method in logistics research. *Journal of Business Logistics*, 17, 93-138.
- Else, J. F., Groze, V., Hornby, H. R., Mirr, K., & Wheelock, J. (1992). Performance-based contracting: The Case of residential Foster-Care. *Child Welfare*, 71, 513-526.
- Enquist, B., Camén, C., & Johnson, M. (2011). Contractual governance for public servicevalue networks. *Journal of Service Management*, 22, 217-240.
- Erez, A., & Judge, T. A. (2001). Relationship of core self-evaluations to goal setting, motivation, and performance. *Journal of Applied Psychology*, 86, 1270-1279.
- Essig, M., Glas, A. H., Selviaridis, K., & Roehrich, J. K. (2016). Performance-based contracting in business markets. *Industrial Marketing Management*, 59, 5-11.
- Fama, E. F., & Jensen, M. C. (1983). Agency problems and residual claims. *The Journal of Law and Economics*, 26, 327-349.
- Fang, E. (Er), Palmatier, R. W., & Steenkamp, J. B. E. (2008). Effect of Service Transition Strategies on Firm Value. *Journal of Marketing*, 72, 1-14.

- Fayezi, S., O’Laughlin, A., & Zutshi, A. (2012). Agency Theory and Supply Chain Management: A Structured Literature Review. *Supply Chain Management: An International Journal*, 17, 556–570.
- Finne, M., & Holmström, J. (2013). A manufacturer moving upstream: triadic collaboration for service delivery. *Supply Chain Management: An International Journal*, 18, 21–33.
- Fiske, S. T., & Taylor, S. E. (1991). *Social Cognition* (2nd ed.). New York: McGraw-Hill.
- Flynn, B., Pagell, M., & Fugate, B. (2018). Survey Research Design in Supply Chain Management: The Need for Evolution in Our Expectations. *Journal of Supply Chain Management*, 54, 1-15.
- Fong, E. A., & Tosi, H. L. (2007). Effort, performance, and conscientiousness: An agency theory perspective. *Journal of Management*, 33, 161-179.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39-50.
- Forza, C. (2002). Survey research in operations management: a processed-based perspective. *International Journal of Operations and Production Management*, 22, 152-94.
- Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation. *Journal of Management*, 43, 200–227.
- Francart, N., Larsson, M., Malmqvist, T., Erlandsson, M., & Florell, J. (2019). Requirements set by Swedish municipalities to promote construction with low climate change impact. *Journal of Cleaner Production*, 208, 117-131.
- Franceschini, F., Galetto, M., & Maisano, D. (2007). *Management by measurement: Designing key indicators and performance measurement systems*. Berlin: Springer Verlag Berlin Heidelberg.
- Frey, B. S. (1993). Does monitoring increase work effort? The rivalry with trust and loyalty. *Economic Inquiry*, 31, 663-670.
- Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management*, 19, 185–200.

- Furubotn, E. G., & Pejovich, S. (1972). Property rights and economic theory: a survey of recent literature. *Journal of Economic Literature*, 10, 1137-1162.
- Gebauer, H., Gustafsson, A., & Witell, L. (2011). Competitive advantage through service differentiation by manufacturing companies. *Journal of Business Research*, 64, 1270-1280.
- Gino, F., & Pisano, G. (2008). Toward a theory of behavioral operations. *Manufacturing Service Operations Management*, 10, 676–691.
- Glas, A. H., Henne, F. U., & Essig, M. (2018). Missing performance management and measurement aspects in performance-based contracting: A systematic process-based literature analysis of an astonishing research gap. *International Journal of Operations & Production Management*, 38, 2062-2095.
- Glas, A. H., Raithel, C., & Essig, M. (2019). Risk perception in performance based contracts and the influence of experience. *International Journal of Productivity and Performance Management*.
- Grönroos, C. (2008). Service logic revisited: Who creates value? And who Co-creates? *European Business Review*, 20, 298–314.
- Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey Methodology*, Wiley, Hoboken, NJ.
- Gruneberg, S., Hughes, W., & Ancell, D. (2007). Risk under performance-based contracting in the UK construction sector. *Construction Management and Economics*, 25, 691–699.
- Guajardo, J. A., Cohen, M. A., Kim, S. H., & Netessine, S. (2012). Impact of performance-based contracting on product reliability: an empirical analysis. *Management Science*, 58, 961-979.
- Guide, V. D. R., & Ketokivi, M. (2015). Notes from the editors: Redefining some methodological criteria for the journal. *Journal of Operations Management*, 37, v-viii.
- Gulati, R., & Singh, H. (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, 43, 781–814.

- Gulati, R., Lawrence, P. R., & Puranam, P. (2005). Adaptation in vertical relationships: Beyond incentive conflict. *Strategic Management Journal*, 26, 415–440.
- Gunasekaran, A., Patel, C., & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management*, 21, 71–87.
- Guo, L., & Ng, I. (2011). The co-production of equipment-based services: An interpersonal approach. *European Management Journal*, 29, 43–50.
- Gurevich, G., Kliger, D., & Weiner, B. (2012). The role of attribution of causality in economic decision making. *The Journal of Socio-Economics*, 41, 439–444.
- Han, S., Kuruzovich, J., & Ravichandran, T. (2013). Service Expansion of Product Firms in the Information Technology Industry: An Empirical Study. *Journal of Management Information Systems*, 29, 127–158.
- Handley, S. M., & Benton, W. C. (2012). The influence of exchange hazards and power on opportunism in outsourcing relationships. *Journal of Operations Management*, 30, 55–68.
- Handley, S. M., & Gray, J. V. (2013). Inter-organizational Quality Management: The Use of Contractual Incentives and Monitoring Mechanisms with Outsourced Manufacturing. *Production and Operations Management*, 22, 1540–1556.
- Harmon, D. J., Kim, P. H., & Mayer, K. J. (2015). Breaking the letter vs. spirit of the law: How the interpretation of contract violations affects trust and the management of relationships. *Strategic Management Journal*, 36, 497–517.
- Hart, O., & Moore, J. (1990). Property Rights and the Nature of the Firm. *Journal of Political Economy*, 98, 1119–1158.
- Hartmann, E., & Herb, S. (2014). Opportunism risk in service triads – a social capital perspective. *International Journal of Physical Distribution & Logistics Management*, 44, 242–256.
- Harvey, P., Madison, K., Martinko, M., Crook, T. R., & Crook, T. A. (2014). Attribution theory in the organizational sciences: The road traveled and the path ahead. *Academy of Management Perspectives*, 28, 128–146.

- Harvey, P., & Martinko, M. J. (2010). Attribution theory and motivation. In N. Borkowski (Ed.), *Organizational behavior in health care, 2nd edition* (pp. 147-164). Boston, MA: Jones and Bartlett.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford Press.
- Hayes, A. F. (2018). Partial, conditional, and moderated moderated mediation: Quantification, inference, and interpretation. *Communication Monographs*, 85, 1-37.
- Heide, J. B. (1994). Interorganizational governance in marketing channels. *Journal of Marketing*, 58, 71–85.
- Heide, J. B., Wathne, K. H., & Rokkan, A. I. (2007). Interfirm monitoring, social contracts, and relationship outcomes. *Journal of Marketing Research*, 44, 425-433.
- Heider, F. (1958). *The Psychology of Interpersonal Relations*. New York: Wiley.
- Heinrich, C. J., & Choi, Y. (2007). Performance-based contracting in social welfare programs. *The American Review of Public Administration*, 37, 409–435.
- Hernández-Espallardo, M., & Arcas-Lario, N. (2008). Outcome-and behaviour-control in distribution partnerships: the role of trust and dependence and their effects on performance. *The International Review of Retail, Distribution and Consumer Research*, 18, 63-86.
- Hirst, M. K. (1981). Accounting information and the evaluation of subordinate performance: a situational approach. *Accounting Review*, 56, 771-784.
- Hirst, M. K. (1983). Reliance on accounting performance measures, task uncertainty, and dysfunctional behavior: Some extensions. *Journal of Accounting Research*, 21, 596-605.
- Houtekamer, C. (2015). Bluffen en pokeren om de A15. NRC Handelsblad, 23 April, 12–13 (“Bluffing and pokering on the A15 highway”).
- Hyer, N. L., Brown, K. A., & Zimmerman, S. (1999). A socio-technical systems approach to cell design: case study and analysis. *Journal of Operations Management*, 17, 179–203.

- Hypko, P., Tilebein, M., & Gleich, R. (2010). Clarifying the concept of performance-based contracting in manufacturing industries: A research synthesis. *Journal of Service Management*, 21, 625-655.
- Information Service Group (2018). Global Sourcing and As-a-Service Market Insights, available at: https://isg-one.com/docs/default-source/default-document-library/1q18-global-isg-index.pdf?sfvrsn=54f0fd31_2 (accessed 7 June 2018).
- Jain, N., Hasija, S., & Popescu, D.G. (2013). Optimal contracts for outsourcing of repair and restoration services. *Operations Research*, 61, 1295-1311.
- Jap, S. D., & Anderson, E. (2007). Testing a life-cycle theory of cooperative interorganizational relationships: Movement across stages and performance. *Management Science*, 53, 260-275.
- Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, 30, 199-218.
- Jensen, M. C. (1983). Organization theory and methodology. *The Accounting Review*, 58, 319-339.
- Jensen, M. C. (1989). Eclipse of the public corporation. *Harvard Business Review*, 89, 61-75.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.
- Johnson, M., & Mena, C. (2008). Supply chain management for servitised products: A multi-industry case study. *International Journal of Production Economics*, 114, 27-39.
- Kache, F., & Seuring, S. (2017). Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management. *International Journal of Operations & Production Management*, 37, 10-36.
- Katsikopoulos, K. V., & Gigerenzer, G. (2013). Behavioral operations management: A blind spot and a research program. *Journal of Supply Chain Management*, 49, 3-7.

- Kauppi, K., & Van Raaij, E. M. (2015). Opportunism and honest incompetence—Seeking explanations for noncompliance in public procurement. *Journal of Public Administration Research and Theory*, 25, 953–979.
- Kelley, H. H. (1973). The processes of causal attribution. *American Psychologist*, 28, 107–128.
- Kent, R., & Martinko, M. J. (1995a). The development and evaluation of a scale to measure organizational attribution style. In M. J. Martinko (Ed.), *Attribution theory: an organizational perspective* (pp. 53–75). Delray Beach, FL: St. Lucie Press.
- Kent, R., & Martinko, M. J. (1995b). The measurement of attributions in organizational research. In M. J. Martinko (Ed.), *Attribution theory: an organizational perspective* (pp. 17–34). Delray Beach, FL: St. Lucie Press.
- Ketokivi, M., & Choi, T. (2014). Renaissance of case research as a scientific method. *Journal of Operations Management*, 32, 232–240.
- Ketokivi, M., & McIntosh, C.N. (2017). Addressing the endogeneity dilemma in operations management research: Theoretical, empirical, and pragmatic considerations. *Journal of Operations Management*, 52, 1–14.
- Kim, S. H., Cohen, M. A., & Netessine, S. (2007). Performance contracting in after-sales service supply chains. *Management Science*, 53, 1843–1858.
- Kim, J., & Mahoney, J. T. (2005). Property rights theory, transaction costs theory, and agency theory: An organizational economics approach to strategic management. *Managerial and Decision Economics*, 26, 223–242.
- Kirsch, L. J. (1996). The management of complex tasks in organizations: Controlling the systems development process. *Organization Science*, 7, 1–21.
- Kish, L. (1959). Some statistical problems in research design. *American Sociological Review*, 24, 328–338.
- Kleemann, F. C., & Essig, M. (2013). A providers' perspective on supplier relationships in performance-based contracting. *Journal of Purchasing and Supply Management*, 19, 185–198.

- Kowalkowski, C., Kindström, D., & Carlborg, P. (2016). Triadic value propositions: When it takes more than two to tango. *Service Science*, 8, 282-299.
- Kreye, M. E. (2018). Interactions between perceived uncertainty types in service dyads. *Industrial Marketing Management*, 75, 90-99.
- Kreye, M. E. (2019). Does a more complex service offering increase uncertainty in operations?. *International Journal of Operations & Production Management*, 39, 75-93.
- Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The sources of four commonly reported cutoff criteria: What did they really say?. *Organizational Research Methods*, 9, 202-220.
- Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24, 691-710.
- Lay, G., Schroeter, M., & Biege, S. (2009). Service-based business concepts: A typology for business-to-business markets. *European Management Journal*, 27, 442-455.
- Lee, H. L. (2002). Aligning Supply Chain Strategies with Product Uncertainties. *California Management Review*, 44, 105-119.
- Lee, H. L. (2004). The triple-A supply chain. *Harvard Business Review*, 82, 102-113.
- Leonard-Barton, D. (1990). A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. *Organization Science*, 1, 248-266.
- Li, M., & Choi, T. Y. (2009). Triads in services outsourcing: Bridge, bridge decay and bridge transfer. *Journal of Supply Chain Management*, 45, 27-39.
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross sectional research designs. *Journal of Applied Psychology*, 86, 114-121.
- Loch, C., & Wu, Y. (2007). Behavioral operations management. *Foundations and Trends in Technology, Information, and Operations Management*, 1, 121-232.

- Long, C. P., Bendersky, C., & Morrill, C. (2011). Fairness monitoring: Linking managerial controls and fairness judgments in organizations. *Academy of Management Journal*, 54, 1045-1068.
- Long, C. P., Burton, R. M., & Cardinal, L. B. (2002). Three controls are better than one: A computational model of complex control systems. *Computational & Mathematical Organization Theory*, 8, 197-220.
- Long, C. P., & Sitkin, S. B. (2018). Control–Trust Dynamics in Organizations: Identifying Shared Perspectives and Charting Conceptual Fault Lines. *Academy of Management Annals*, 12, 725-751.
- Lumineau, F., & Malhotra, D. (2011). Shadow of the contract: How contract structure shapes interfirm dispute resolution. *Strategic Management Journal*, 32, 532-555.
- Macaulay, S. (1963). Non-contractual relations in business: A preliminary study. *American Sociological Review*, 28, 55–67.
- Maglio, P. P., & Spohrer, J. (2008). Fundamentals of service science. *Journal of the Academy of Marketing Science*, 36, 18-20.
- Mallhotra, D., & Lumineau, F. (2011). Trust and collaboration in the aftermath of conflict: the effects of contract structure. *Academy of Management Journal*, 54, 981-998.
- Mallhotra, M. K., Singhal, C., Shang, G., & Ployhart, R. E. (2014). A critical evaluation of alternative methods and paradigms for conducting mediation analysis in operations management research. *Journal of Operations Management*, 32, 127-137.
- Martin, L. L. (2007). Performance-based contracting for human services: A proposed model. *Public Administration Quarterly*, 31, 130–151.
- Martinko, M. J., Douglas, S. C., & Harvey, P. (2006). Attribution theory in industrial and organizational psychology: A review. In G. P. Hodgkinson & J. K. Ford (Eds.), *International review of industrial and organizational psychology* (pp. 127-187). Chichester, England: Wiley.
- Martinko, M. J., Harvey, P., & Douglas, S. C. (2007a). The role, function, and contribution of attribution theory to leadership: A review. *The Leadership Quarterly*, 18, 561-585.

- Martinko, M. J., Moss, S. E., Douglas, S. C., & Borkowski, N. (2007b). Anticipating the inevitable: When leader and member attribution styles clash. *Organizational Behavior and Human Decision Processes*, 104, 158-174.
- Martinko, M. J., Sikora, D., & Harvey, P. (2012). The relationships between attribution styles, LMX, and perceptions of abusive supervision. *Journal of Leadership & Organizational Studies*, 19(4), 397-406.
- Mayer, K. J., & Argyres, N. S. (2004). Learning to contract: Evidence from the personal computer industry. *Organization Science*, 15, 394-410.
- Mayer, K.J., Nickerson, J.A., & Owan, H. (2004). Are supply and plant inspections complements or substitutes? A strategic and operational assessment of inspection practices in biotechnology. *Management Science*, 50, 1064-1081.
- McAuley, E., Duncan, T. E., & Russell, D. W. (1992). Measuring causal attributions: The revised causal dimension scale (CDSII). *Personality and Social Psychology Bulletin*, 18, 566-573.
- McCutcheon, D. M., & Meredith, J. R. (1993). Conducting case study research in operations management. *Journal of Operations Management*, 11, 239-256.
- Mir, S., Aloysius, J. A., & Eckerd, S. (2017). Understanding supplier switching behavior: the role of psychological contracts in a competitive setting. *Journal of Supply Chain Management*, 53, 3-18.
- Modi, S. B., & Mabert, V. A. (2007). Supplier development: Improving supplier performance through knowledge transfer. *Journal of Operations Management*, 25, 42-64.
- Modi, S. B., Wiles, M. A., & Mishra, S. (2015). Shareholder value implications of service failures in triads: the case of customer information security breaches. *Journal of Operations Management*, 35, 21-39.
- Montabon, F. L., Daugherty, P., & Chen, H. (2018). Setting standards for single respondent survey design. *Journal of Supply Chain Management*, 54, 35-41.

- Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, 89, 852–863.
- Narasimhan, R., & Jayaram, J. (1998). Reengineering service operations: a longitudinal case study. *Journal of Operations Management*, 17, 7–22.
- Narayanan, S., Jayaraman, V., Luo, Y., & Swaminathan, J. M. (2011). The antecedents of process integration in business process outsourcing and its effect on firm performance. *Journal of Operations Management*, 29, 3-16.
- Narayanan, V. G., & Raman, A. (2004). Aligning incentives in supply chains. *Harvard Business Review*, 82, 94-102.
- Neely, A. (2009). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1, 103-118.
- Nenonen, S., Ahvenniemi, O., & Martinsuo, M. (2014). Image risks of servitization in collaborative service deliveries. *The Service Industries Journal*, 34, 1307-1329.
- Ng, I. C., Maull, R., & Yip, N. (2009). Outcome-based contracts as a driver for systems thinking and service-dominant logic in service science: Evidence from the defence industry. *European Management Journal*, 27, 377-387.
- Ng, I. C., & Nudurupati, S. S. (2010). Outcome-based service contracts in the defence industry—mitigating the challenges. *Journal of Service Management*, 21, 656-674.
- Nielsen, H., Kristensen, T. B., & Grasso, L. P. (2018). The performance effects of complementary management control mechanisms. *International Journal of Operations & Production Management*, 38, 2124-2148.
- Nilakant, V., & Rao, H. (1994). Agency theory and uncertainty in organizations: An evaluation. *Organization Studies*, 15, 649-672.
- Niranjan, T. T., & Metri, B. A. (2008). Client-vendor-end user triad: a service quality model for IS/ITES outsourcing. *Journal of Services Research*, 8, 123-138.
- Nullmeier, F. M. E., Wynstra, F., & Van Raaij, E. M. (2016). Outcome attributability in performance-based contracting: Roles and activities

- of the buying organization. *Industrial Marketing Management*, 59, 25-36.
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Nyaga, G. N., Whipple, J. M., & Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ?. *Journal of Operations Management*, 28, 101-114.
- O'Farrell, P. N., & Moffat, L. A. (1991). An interaction model of business service production and consumption. *British Journal of Management*, 2, 205–221.
- Oliva, R., & Kallenberg, R. (2003). Managing the transition from product to services. *International Journal of Service Industry Management*, 14, 160–172.
- Oliva, R., & Watson, N. (2010). Cross-functional alignment in supply chain planning: A case study of sales and operations planning. *Journal of Operations Management*, 29, 434–448.
- Oliva, R., & Watson, N. (2011). Cross-functional alignment in supply chain planning: A case study of sales and operations planning. *Journal of Operations Management*, 29, 434–448.
- Opresnik, D., & Taisch, M. (2015). The value of big data in servitization. *International Journal of Production Economics*, 165, 174-184.
- Orton, J. D. (1997). From inductive to iterative grounded theory: Zipping the gap between process theory and process data. *Scandinavian Journal of Management*, 13, 419–438.
- Ostrom, A. L., Parasuraman, A., Bowen, D. E., Patrício, L., & Voss, C. A. (2015). Service Research Priorities in a Rapidly Changing Context. *Journal of Service Research*, 18, 127–159.
- Ouchi, W. G. (1979). A conceptual framework for the design of organizational control mechanisms. *Management Science*, 25, 833–848.
- Ouchi, W. G., & Maguire, M. A. (1975). Organizational Control : Two Functions. *Administrative Science Quarterly*, 20, 559–569.
- Pagell, M., & LePine, J. A. (2002). Multiple case studies of team effectiveness in manufacturing organizations. *Journal of Operations*

- Management*, 20, 619–639.
- Palan, S., & Schitter, C. (2018). Prolific.ac—a subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, 17, 22–27.
- Pedhazur, E. J., & Schmelkin, L. P. (1991). *Measurement, design, and analysis: An integrated approach*. Hillsdale: Lawrence Erlbaum.
- Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2005). Supplier integration into new product development: coordinating product, process and supply chain design. *Journal of Operations Management*, 23, 371–388.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879–903.
- Poppo, L., Zhou, K. Z., & Zenger, T. R. (2008). Examining the conditional limits of relational governance: Specialized assets, performance ambiguity, and long-standing ties. *Journal of Management Studies*, 45, 1195–1216.
- Porter, M. E., & Heppelmann, J. E. (2015). How smart, connected products are transforming companies. *Harvard Business Review*, 93, 96–114.
- Potts, G. W. (1988). Exploiting Your Product’s Service Life Cycle. *Harvard Business Review*, 32–36.
- Proudfoot, J. G., Corr, P. J., Guest, D. E., & Gray, J. A. (2001). The development and evaluation of a scale to measure occupational attributional style in the financial services sector. *Personality and Individual Differences*, 30(2), 259–270
- Hollenbeck, J. R., & Wright, P. M. (2017). Harking, sharking, and tharking: Making the case for post hoc analysis of scientific data. *Journal of Management*, 43, 5–18.
- Ramaswami, S.N. (1996). Marketing controls and dysfunctional employee behaviors: A test of traditional and contingency theory postulates. *The Journal of Marketing*, 60, 105–120.
- Rabetino, R., Harmsen, W., Kohtamäki, M., & Sihvonen, J. (2018). Structuring servitization-related research. *International Journal of*

- Operations & Production Management*, 38, 350–371.
- Rai, A., Patnayakuni, R. & Seth. N. (2006). Firm Performance Impacts of Digitally Enabled Supply Chain Integration Capabilities. *MIS Quarterly*, 30, 225-246.
- Randall, W. S., Pohlen, T. L., & Hanna, J. B. (2010). Evolving a theory of performance-based logistics using insights from service dominant logic. *Journal of Business Logistics*, 31, 35–61.
- Randall, W. S., Nowicki, D. R., & Hawkins, T. G. (2011). Explaining the effectiveness of performance-based logistics: A quantitative examination. *The International Journal of Logistics Management*, 22, 324–348.
- Reeves, T. K., & Woodward, J. (1970). The study of managerial control. In J. Woodward (Ed.), *Industrial Organization: Behaviour and Control* (pp. 37–56). London: Oxford University Press.
- Reim, W., Parida, V., & Örtqvist, D. (2015). Product–Service Systems (PSS) business models and tactics – a systematic literature review. *Journal of Cleaner Production*, 97, 61–75.
- Richardson, H. A., Simmering, M. J., & Sturman, M. C. (2009). A tale of three perspectives: Examining post hoc statistical techniques for detection and correction of common method variance. *Organizational Research Methods* 12, 762-800.
- Rifkin, J. (2000). *The age of access: the new culture of hypercapitalism, where all of life is a paid-for experience*. New York: Tarcher/Putnam.
- Ro, Y. K., Su, H. C., & Chen, Y. S. (2016). A tale of two perspectives on an impending supply disruption. *Journal of Supply Chain Management*, 52, 3-20.
- Ross, S. A. (1973). The economic theory of agency: The principal's problem. *The American Economic Review*, 63, 134-139.
- Rossiter, J. R. (2002). The C-OAR-SE procedure for scale development in Marketing. *International Journal of Research in Marketing*, 19, 305-335.
- Rudolph, U., Roesch, S., Greitemeyer, T., & Weiner, B. (2004). A meta-analytic review of help giving and aggression from an attributional

- perspective: Contributions to a general theory of motivation. *Cognition and Emotion*, 18, 815-848.
- Rungtusanatham, M., Miller, J. W., & Boyer, K. K. (2014). Theorizing, testing, and concluding for mediation in SCM research: Tutorial and procedural recommendations. *Journal of Operations Management*, 32, 99-113.
- Rungtusanatham, M., Wallin, C., & Eckerd, S. (2011). The vignette in a scenario-based role-playing experiment. *Journal of Supply Chain Management*, 47, 9-16.
- Russell, D. W., McAuley, E., & Tarico, V. (1987). Measuring causal attributions for success and failure: A comparison of methodologies for assessing causal dimensions. *Journal of Personality and Social Psychology*, 52, 1248-1257.
- Russell, D. W. (1991). The measurement of attribution process: Trial and situational approaches. In S. L. Zelen (Ed.), *New models, new extensions of attribution theory*. New York, NY: Springer-Verlag.
- Saghiri, S. (2011). A structural approach to assessing postponement strategies: construct development and validation. *International Journal of Production Research*, 49, 6427-6450.
- Sampson, S. E. (2000). Customer-supplier duality and bidirectional supply chains in service organizations. *International Journal of Service Industry Management*, 11, 348-364.
- Sampson, S. E., & Froehle, C. M. (2006). Foundations and implications of a proposed unified services theory. *Production and Operations Management*, 15, 329-343.
- Sampson, S. E., & Spring, M. (2012). Customer roles in service supply chains and opportunities for innovation. *Journal of Supply Chain Management*, 48, 30-50.
- Samson, D., & Terziovski, M. (1999). The relationship between total quality management practices and operational performance. *Journal of Operations Management*, 17, 393-409.
- Schepker, D. J., Oh, W. Y., Martynov, A., & Poppo, L. (2014). The many futures of contracts moving beyond structure and safeguarding to coordination and adaptation. *Journal of Management*, 40, 193-225.

- Seligman, M. E., & Schulman, P. (1986). Explanatory style as a predictor of productivity and quitting among life insurance sales agents. *Journal of Personality and Social Psychology*, 50, 832-838.
- Selviaridis, K., & Norrman, A. (2014). Performance-based contracting in service supply chains: a service provider risk perspective. *Supply Chain Management: An International Journal*, 19, 153-172.
- Selviaridis, K., & Spring, M. (2018). Supply chain alignment as process: contracting, learning and pay-for-performance. *International Journal of Operations and Production Management*, 38, 732-755.
- Selviaridis, K., & Van der Valk, W. (2018). Framing contractual performance incentives: effects on supplier behaviour. *International Journal of Operations and Production Management* (In Press).
- Selviaridis, K., & Wynstra, F. (2015). Performance-based contracting: a literature review and future research directions. *International Journal of Production Research*, 53, 3505-3540.
- Selviaridis, K., Agndal, H., & Axelsson, B. (2011). Business services ‘in the making’: (De) stabilisation of service definitions during the sourcing process. *Journal of Purchasing and Supply Management*, 17, 73-86.
- Sengupta, S., Niranjan, T. T., & Krishnamoorthy, M. (2018). Trends and directions in service triads research. *International Journal of Physical Distribution & Logistics Management*, 48, 333-360.
- Settanni, E., Thenent, N. E., Newnes, L. B., Parry, G., & Goh, Y. M. (2017). Mapping a product-service-system delivering defence avionics availability. *International Journal of Production Economics*, 186, 21-32.
- Siemsen, E. (2011). The usefulness of behavioral laboratory experiments in supply chain management research. *Journal of Supply Chain Management*, 47, 17-18.
- Sihag, V., & Rijdsdijk, S. A. (2018). Organizational Controls and Performance Outcomes: A Meta-Analytic Assessment and Extension. *Journal of Management Studies*, 56, 91-133.
- Silver, M. (1989). *Foundations of Economic Justice*. New York: Basil Blackwell.

- Sitkin, S. B., Cardinal, L. B., & Bijlsma-Frankema, K. M. (2010). *Organizational control*. Cambridge: Cambridge University Press.
- Slack, N., & Lewis, M. (2002). *Operations Strategy*. Harlow: Prentice-Hall.
- Soeters, R., & Griffiths, F. (2003). Improving government health services through contract management: A case from Cambodia. *Health Policy and Planning*, 18, 74–83.
- Sols, A., & Johannesen, L. H. (2013). The role of transition contracts in performance-based logistics initiatives. *Systems Engineering*, 16, 453–463.
- Soundararajan, V., & Brammer, S. (2018). Developing country sub-supplier responses to social sustainability requirements of intermediaries: Exploring the influence of framing on fairness perceptions and reciprocity. *Journal of Operations Management*, 58–59, 42–58.
- Spacewar.com (2013). BAe touts maintenance work for Royal Navy. (23 January 2013), www.spacewar.com.
- Specter, P. & Brannick, M. T. (2011). Methodological urban legends: The misuse of statistical control variables. *Organizational Research Methods*, 14, 287-305.
- Spring, M., & Araujo, L. (2009). Service, services and products: rethinking operations strategy. *International Journal of Operations & Production Management*, 29, 444–467.
- Spring, M., & Araujo, L. (2017). Product biographies in servitization and the circular economy. *Industrial Marketing Management*, 60, 126–137.
- Sprouse, J. (2011). A validation of Amazon Mechanical Turk for the collection of acceptability judgments in linguistic theory. *Behavior Research Methods*, 43, 155–167.
- Ssengooba, F., McPake, B., & Palmer, N. (2012). Why performance-based contracting failed in Uganda—an “open-box” evaluation of a complex health system intervention. *Social Science & Medicine*, 75, 377-383.
- Stahel, W. R. (2005). The Functional Economy: Cultural and Organizational Change. *International Journal of Performability Engineering*, 1, 121.

- Steinbach, T., Wallenburg, C. M., & Selviaridis, K. (2018). Me, myself and I: Non-collaborative customer behavior in service outsourcing—the key role of outcome orientation and outcome attributability. *International Journal of Operations & Production Management*, 38, 1519-1539.
- Stoughton, M., & Votta, T. (2003). Implementing service-based chemical procurement: lessons and results. *Journal of Cleaner Production*, 11, 839–849.
- Stouthuysen, K., Slabbinck, H., & Roodhooft, F. (2012). Controls, service type and perceived supplier performance in interfirm service exchanges. *Journal of Operations Management*, 30, 423-435.
- Strauss, A., & Corbin, J. (1990). *Basics of Qualitative Research*. Newbury Park, California: Sage Publications.
- Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R., & Samson, D. (2002). Effective case research in operations management: a process perspective. *Journal of Operations Management*, 20, 419–433.
- Suarez, F. F., Cusumano, M. A., & Kahl, S. J. (2013). Services and the Business Models of Product Firms: An Empirical Analysis of the Software Industry. *Management Science*, 59, 420-435.
- Sumo, R., Van der Valk, W., Duysters, G., & Van Weele, A. (2016). Using performance-based contracts to foster innovation in outsourced service delivery. *Industrial Marketing Management*, 59, 12-24.
- Sumo, R., Van der Valk, W., Van Weele, A., & Bode, C. (2016). Fostering incremental and radical innovation through performance-based contracting in buyer-supplier relationships. *International Journal of Operations & Production Management*, 36, 1482-1503.
- Tate, W. L., Ellram, L. M., Bals, L., Hartmann, E., & van der Valk, W. (2010). An agency theory perspective on the purchase of marketing services. *Industrial Marketing Management*, 39, 806–819.
- Tate, W.L., & Van der Valk, W. (2008). Managing the performance of outsourced customer contact centers. *Journal of Purchasing and Supply Management*, 14, 160-169.
- Thompson, J. (1967). *Organizations in action*. Chicago: McGraw-Hill.
- Tietze, F., Pieper, T., & Herstatt, C. (2015). To own or not to own: How ownership impacts user innovation—An empirical study. *Technovation*,

38, 50–63.

- Tiwana, A., & Keil, M. (2007). Does peripheral knowledge complement control? An empirical test in technology outsourcing alliances. *Strategic Management Journal*, 28, 623–634.
- Uenk, N., & Telgen, J. (2018). Managing challenges in social care service triads – Exploring public procurement practices of Dutch municipalities. *Journal of Purchasing and Supply Management* ('Accepted Article'),
- Uлага, W., & Reinartz, W. J. (2011). Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully. *Journal of Marketing*, 75, 5–23.
- Vachon, S., Halley, A., & Beaulieu, M. (2009). Aligning competitive priorities in the supply chain: The role of interactions with suppliers. *International Journal of Operations and Production Management*, 29, 322–340.
- Van Aken, J., Chandrasekaran, A., & Halman, J. (2016). Conducting and publishing design science research: Inaugural essay of the design science department of the Journal of Operations Management. *Journal of Operations Management*, 47–48, 1–8.
- Van de Ven, A. H., Delbecq, A. L., & Koenig, R., Jr. (1976). Determinants of coordination modes within organizations. *American Sociological Review*, 41, 322–338.
- Van De Ven, A. H., & Poole, M. S. (1995). Explaining Development and Change in Organizations. *Academy of Management Review*, 20, 510–540.
- Van den Hoonaard, W. C. (1996). *Analytical field research: Working with sensitizing concepts*. New York: Sage Publications.
- Van der Valk, W., & Van Iwaarden, J. (2011). Monitoring in service triads consisting of buyers, subcontractors and end customers. *Journal of Purchasing & Supply Management*, 17, 198–206.
- Van Weele, A. J., & Van Raaij, E.M. (2014). The future of purchasing and supply management research: About relevance and rigor. *Journal of Supply Chain Management*, 50, 56–72.
<https://doi.org/10.1111/jscm.12042>

- Vanneste, B., & Puranam, P. (2010). Repeated interactions and contractual detail: Identifying the learning effect. *Organization Science*, 21, 186–201.
- Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. (2017). Servitization, digitization and supply chain interdependency. *Industrial Marketing Management*, 60, 69–81.
- Visnjic, I., Bart, K., Looy, V., & Neely, A. (2013). Steering Manufacturing Firms Towards Service Business Model Innovation. *California Management Review*, 56, 100–123.
- Visnjic, I., Jovanovic, M., Neely, A., & Engwall, M. (2017). What brings the value to outcome-based contract providers? Value drivers in outcome business models. *International Journal of Production Economics*, 192, 169–181.
- Visnjic, I., & Van Looy, B. (2013). Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, 31, 169–180.
- Voss, C., Tsikriktsis, N., & Frohlich, M. (2002). Case research in operations management. *International Journal of Operations & Production Management*, 22, 195–219.
- Voss, C. (2009). *Researching operations management*, in Karlsson, C., (Eds.), *Researching Operations Management*, Routledge, New York, NY, pp.6–42.
- Walker, H., Chicksand, D., Radnor, Z., & Watson, G. (2015). Theoretical perspectives in operations management: an analysis of the literature. *International Journal of Operations & Production Management*, 35, 1182–1206.
- Wang, Q., Kayande, U., & Jap, S. (2010). The Seeds of Dissolution: Discrepancy and Incoherence in Buyer–Supplier Exchange. *Marketing Science*, 29, 1109–1124.
- Wang, W., Lai, K. H., & Shou, Y. (2018). The impact of servitization on firm performance: a meta-analysis. *International Journal of Operations and Production Management*, 38, 1562–1588.
- Wang, X., & Yang, Z. (2013). Inter-firm opportunism: a meta-analytic review and assessment of its antecedents and effect on

- performance. *Journal of Business & Industrial Marketing*, 28, 137-146.
- Wathne, K. H., & Heide, J. B. (2000). Opportunism in Interfirm Relationships: Forms, Outcomes, and Solutions. *Journal of Marketing*, 64, 36–51.
- Weber, L. & Mayer, K. J. (2011). Designing effective contracts: Exploring the influence of framing and expectations. *Academy of management review*, 36, 53-75.
- Weber, L., Mayer, K. J., & Macher, J. T. (2011). An analysis of extendibility and early termination provisions: The importance of framing duration safeguards. *Academy of Management Journal*, 54, 182-202.
- Weick, K. E. (1989). Theory construction as disciplined imagination. *Academy of Management Review*, 14, 516–531.
- Weiner, B. (1986). *An Attributional Theory of Motivation and Emotion*. New York: Springer-Verlag.
- Weiner, B. (2018). The Legacy of an Attribution Approach to Motivation and Emotion: A No-Crisis Zone. *Motivation Science*, 4, 4-14.
- Whipple, J. M., & Roh, J. (2010). Agency theory and quality fade in buyer-supplier Relationships. *The International Journal of Logistics Management*, 21, 338-352.
- Wise, R., & Baumgartner, P. (1999). Go downstream: The new profit imperative in manufacturing. *Harvard Business Review*, 78, 168.
- Wong, P. T., & Weiner, B. (1981). When people ask" why" questions, and the heuristics of attributional search. *Journal of Personality and Social Psychology*, 40, 650-663.
- Worm, S., Bharadwaj, S. G., Ulaga, W., & Reinartz, W. J. (2017). When and why do customer solutions pay off in business markets? *Journal of the Academy of Marketing Science*, 45, 490–512.
- Wynstra, F. (2015). *Prestatiecontracten in dienstentriades: sturen op resultaat vanaf de zijlijn*. Zoetermeer: NEVI (“Performance-based contracts in service triads: steering on the sidelines towards results.”).

- Wynstra, F., Spring, M., & Schoenherr, T. (2015). Service triads: A research agenda for buyer–supplier–customer triads in business services. *Journal of Operations Management*, 35, 1-20.
- Yin, R. K. (2009). *Case study research: Design and methods*. Thousand Oaks, CA: Sage Publications.
- Zervas, G., Proserpio, D., & Byers, J. W. (2017). The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry. *Journal of Marketing Research*, 54, 687-705.
- Zhang, J. J., Lawrence, B., & Anderson, C. K. (2015). An agency perspective on service triads: linking operational and financial performance. *Journal of Operations Management*, 35, 56-66.
- Zu, X., & Kaynak, H. (2012). An agency theory perspective on supply chain quality management. *International Journal of Operations & Production Management*, 32, 423-446.

APPENDICES

APPENDIX A. Measurement of constructs

Constructs, Sources and Measurement Items	Factor Loadings	Bivariate Correlations
Outcome uncertainty (OUTCUNC, CR = .84, CA = .78, AVE = .57); adapted based on Celly and Frazier (1996), Eisenhardt (1989a), Nilakant and Rao (1994) <i>These questions concern the extent to which external factors cause uncertainty as to the delivery of agreed-upon performance. To what extent do you agree with the statements below:</i>		
1. Many external factors affect the service delivery performance experienced by the end-customer.	.80	
2. The performance experienced by the end-customer can fluctuate extensively over time.	.83	
3. The performance experienced by the end-customer is difficult to predict.	.78	
4. The relationship between the performance experienced by the end-customer and the effort expended by the supplier is unclear.	.60	
Buyer satisfaction (BUYSATIS, formative construct); developed based on Edvardsson and Olsson, (1996), Grönroos (1982), Nyaga et al. (2010) <i>These questions concern the extent to which your organization is satisfied with the service delivery process.</i>		
1. My organization is satisfied with the service delivery process.		.678**
<i>These questions concern the extent to which your organization is satisfied with the service. My organization is satisfied with:</i>		
2. The quality of the service provided.		.728**

3. Contributions made to the improvement of processes or services.	.745**
4. Realized cost reductions associated with the service.	.774**
5. Positive contributions concerning the margin, revenue or return.	.711**
Responsibility shirking (RESPSHIR, CR = .84, CA = .74, AVE = .63); adapted based on Wang et al. (2010)	
<i>If problems arise, how often does the supplier act in the following manner:</i>	
1. The supplier does not stick to its promises.	.85
2. The supplier is not available.	.77
3. The supplier does not keep us updated.	.76
Performance specification (PERFSPEC, formative construct): developed based on Martin (2007)	
<i>These questions concern contract provisions. Classify each item based on the extent to which expected performance has been specified in the contract:</i>	
1. Performance criteria concerning the end-customer (e.g., end-customer satisfaction).	.702**
2. Performance criteria concerning my organization as the buyer (e.g., optimization of processes).	.619**
3. Specific targets to be achieved in service delivery to the end-customer (e.g., customer satisfaction score of at least 8 out of 10).	.719**
4. Specific targets to be achieved in service delivery to my organization (e.g., cost reduction of 5%).	.567**
5. Financial bonus linked to the achievement of end-customer performance targets.	.718**
6. Financial penalty linked to a failure to achieve end-customer performance targets.	.820**
7. Financial bonus linked to the achievement of my organization's performance targets.	.735**
8. Financial penalty linked to a failure to achieve my organization's performance targets.	.822**

9. Conditions taken into account when deciding whether to pay the bonus or levy the penalty (provisions that specify exceptions).	.731**
---	--------

Behavior specification (BEHSPEC, formative construct); developed based on Martin (2007), Argyres and Mayer (2007)

These questions concern contract provisions. Rate each item based on the extent to which procedures and processes have been specified in the contract:

- | | |
|---|--------|
| 1. Operational activities to be carried out by the supplier. | .647** |
| 2. Management and control activities to be carried out by the supplier. | .866** |
| 3. Provisions concerning the procedures used to measure the supplier's performance. | .818** |
| 4. Frequency, type and content of management reports and discussions submitted to/between supplier and my organization. | .801** |

Performance evaluation (PERFEVAL, formative construct); adopted from Dekker and Van den Abbeele (2010)

These questions concern the extent to which the supplier's performance is monitored and rewarded. To what extent do you agree or disagree with the following statements:

- | | |
|--|--------|
| 1. We monitored the extent to which the supplier achieved the performance goals. | .778** |
| 2. If performance goals were not met, the supplier was required to explain why. | .664** |
| 3. We provided feedback about the extent to which the supplier achieved the goals. | .726** |
| 4. The supplier's rewards were based on performance in relation to the goals. | .872** |
| 5. We pay bonuses and levy fines in accordance with what is specified in the contract. | .852** |

Behavior evaluation (BEHEVAL, formative construct); adopted from Dekker and Van den Abbeele (2010)

These questions concern the extent to which the supplier operates according to specified procedures. To what extent do you agree or disagree with the following statements:

- | | |
|---|--------|
| 1. We monitored the extent to which the supplier followed established procedures. | .840** |
| 2. We evaluated the procedures the supplier used to accomplish a given task. | .773** |
| 3. We tried to modify the supplier's procedures when the desired results were not obtained. | .733** |
| 4. We provided feedback on the manner in which the supplier had accomplished the performance goals. | .728** |
| 5. So that we could evaluate the methods used by the supplier, the supplier had to report to us periodically. | .811** |

Buyer size (BUYSIZE, single-item scale, number of employees); adopted from Carey et al, (2011), Stouthuysen et al. (2012)

1. How many individuals does your firm employ?

Buyer dependence on supplier (BUYDEP, CR = .87, CA = .80, AVE = .64); adopted from Hernández-Espallardo and Arcas-Lario, 2008, Jap and Anderson (2007)

These questions concern the dependence of your organization on the supplier. To what extent do you agree or disagree with the following statements:

- | | |
|---|-----|
| 1. If the relationship with this supplier were to end, it would be challenging to serve the end-customer. | .87 |
| 2. We depend on this supplier. | .85 |
| 3. It would be challenging to replace this supplier. | .81 |
| 4. We do not have a good alternative to this supplier. | .64 |

Relationship continuation (RELCON, single-item scale, yes/no); Stouthuysen et al., 2012

1. Has your organization conducted business with this supplier prior to this contractual relationship?
-

Service importance (SERVIMP, formative construct); Cannon et al., 2000, Carey et al., 2011, Stouthuysen et al., 2012

These questions concern the importance of the contracted service for the overall value proposition of your organization. This service:

1. Is essential to the end-customer as a part of the overall offering of goods and/or services by my organization.
2. Accounts for a large part of the goods and/or service offering of my organization to the end-customer.
3. Contributes a great deal to the distinctiveness of the overall goods and/or service offering of my organization to the end-customer.

Marker variable, end-customer dependence on supplier (formative construct); adapted from Jap and Anderson (2007)

1. The customer is dependent on the supplier.
2. It would be difficult for the client to replace the supplier.
3. The client does not have a good alternative to the supplier.

Notes: CR = composite reliability; CA = Cronbach's alpha; AVE = average variance extracted.

APPENDIX B. Coding scheme

Concepts	Sub-concepts	Explanation
Supply chain roles of the buyer	Design engineer	Buyer designs products and production processes
	Production manager	Buyer plans and executes the conversion of inputs into outcomes
	Labor	Buyer provides production effort
	Component supplier	Buyer provides essential process components
	Inventory	Buyer buffers mismatches between supply and demand
	Product	Buyer is the object of production
	Quality assurance	Buyer assures the quality is acceptable
Contract management activities	Monitoring	Activities executed to monitor the supplier's performance
	Enforcing	Activities executed to enforce the contract based upon the supplier's performance
	Coordinating	Activities executed to coordinate the buyer's and supplier's operations
	Cooperating	Activities executed to align the buyer's and supplier's interests

APPENDIX C. Validation of case study results

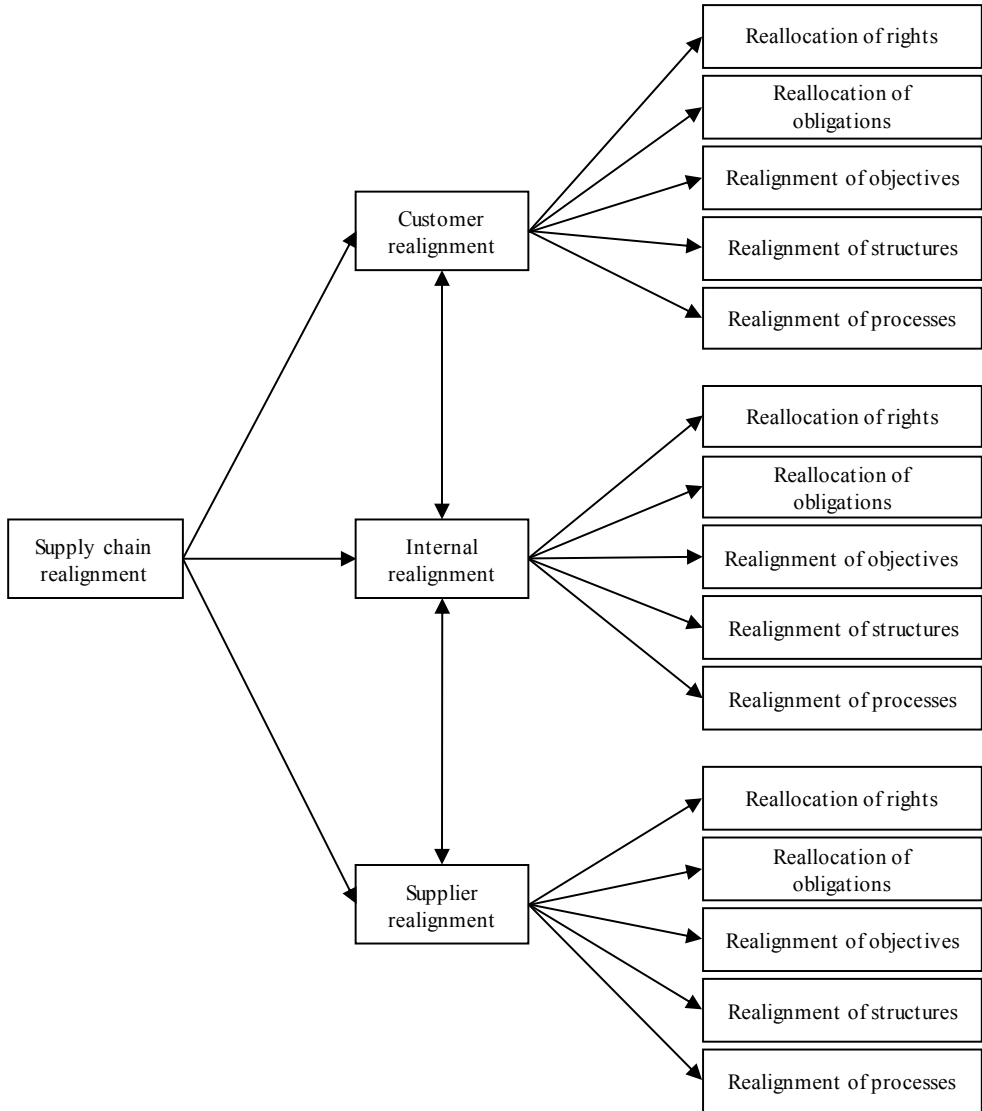
Quality Criterion	Definition	Tactic
Integrity: Internal Validity	The extent to which conclusions can be drawn for causal effects and a causal relationship can be established	• Pattern matching • Explanation building • Rule out rival explanations • Establish a chain of evidence
Credibility: Measurement Validity	The extent to which the research instruments measure what they are supposed to measure	• Use multiple sources of evidence • Presentation of findings to case organizations
Transferability: External Validity	Extent to which the research results can be applied to the populations and the settings of interest	• Specification of the population of interest • Purposeful sampling • Use replication logic in multiple case studies • Establish boundary conditions for study findings
Dependability: Reliability	Extent to which the findings demonstrate repeatability	• Transcribing of interviews • Use case study protocol • Develop case study database

Adapted from Borsboom, Mellenbergh and Van Heerden, 2004; Yin, 2009; Beverland & Lindgreen, 2010; Tate et al., 2010

APPENDIX D. Case context comparison

	Train operator	University hospital
Mix of performance- & behavior-based clauses	Yes	Yes
Partnership	Yes	Yes
Joint venture	No	Yes
To be cleaned	2,800 carriages & locomotives	175,000 m ²
Cleaning personnel	600	200
KPIs	Quality, safety & personnel	Quality & performance managing partner
Bonus	Annually: max 1.5 % of net revenue	Quarterly (quality): max €6,000 net Biannually (performance managing partner): max €6,000 net
Fine	Quarterly: max 1.5 % of net revenue	Monthly: max 30 % of cleaning fee for specific object & max 25 % of management fee

APPENDIX E. Coding tree



APPENDIX F. Overview of episodic sequences

SC alignment sequences	Description	Exemplary quotations (in brackets: informant, business function and data collection period)
(1) Customer alignment - Internal alignment	Financial risk exposure associated with obligations tied to offering service-based business models initiated changes in objectives for the manufacturer's business functions. More specifically, reliability improvement became an important companywide objective in addition to cost reductions.	What you see is that the modality of MR is becoming more ... mature. It used to be kind of a new modality with all kinds of technology developments going on constantly. ... And what you then also see is that customers, they do not accept anymore that it breaks down often. They just want a piece of equipment that generates beautiful images for them, and they do not like the fact that it is breaking down or it is hampering, they just want to have patient throughput. ... However, that does not mean that our state-of-the-art reliability wise of our machines is there to meet it. That is why recently we have put huge effort into improving the reliability (Manager customer excellence, marketing – 2016). Reliability improvement is an ongoing process in new-product development projects including many different tools, such as Kaizen, Design for Excellence, and Lean. But reliability improvements do not only regard the hardware but also services. Customers can facilitate this themselves by engaging in self-service, report problems more clearly, and else (Business developer, marketing – 2016). An important step to improve quality is the translation that needs to be made from marketing requirements to system requirements such that those can be translated to PPM requirements (Procurement engineer, procurement – 2017).
(2) Internal alignment - Supplier alignment	Recognizing that specified reliability targets could only be achieved in collaboration with its supply base, initiated a change in objectives communicated to preferred suppliers. More specifically, quality agreements were implemented across the supply base to ensure that reliability of components is improved.	[W]hat you need to ensure is the pure reliability of your system. Because, exactly, you are kind of, uh, yeah, turnkey deal also with your customer. So, your marginality can be, uh, diminished by the downtime. So, what became relevant in my agreement with my suppliers, is to ensure, uh, minimum failure rate where the suppliers need to comply. That is the reason why the warranty is not relevant anymore. Because I move the link to the time, the dependency of the time, which where you have the warranty, to the quality level, and then make that warranty independent (Supplier account manager, procurement – 2016). We currently undertake efforts to change together with our customer [HTI] toward providing better services to end-customers [hospitals]. One example is a recent effort to receive a certificate of complying with an ISO norm. In fact, the customer required us to obtain this ISO norm in order to continue our business relationship. We recognize the need for us to be part of the industry's change. We will need to take on more responsibilities in the future (Chief executive officer, preferred supplier – 2016). Procurement is now starting to add the first reliability specs to supplier contracts. – The one thing that I am very positive about are the developments related to reliability requirements during the last year. ... Reliability targets have become an important conversation topic with suppliers (Procurement engineer, procurement – 2017).
(3) Internal & Supplier alignment - Customer alignment	As a result of the increased focus on reliability, organizational functions were able to feed the marketing function with insights concerning reliability of the systems on offer. Based on this information the marketing function would adjust customer contracts to decrease financial risk exposure.	It would be very beneficial for marketing to know which level of reliability procurement is able to deliver. Based on that knowledge we could make a far better decision concerning which business models to offer to our customers (Business development manager, marketing – 2018). We are working on a [contract clause] in which we tell the customer, if you do not want to connect your system [to our network] the contract will be more expensive. Because if we do need to service a system, we cannot do that remotely [if a system is not connected to our system]. This means that we will have to send one of our engineers to their site (Reliability manager, quality – 2018). We are talking [with marketing] about the business models that can be used [to sell solutions] (Senior director global procurement engineering, procurement – 2018).

SUMMARY

This dissertation contributes to theory and practice by studying how organizations can effectively contract uncertain performance outcomes. This dissertation reports on four empirical studies, which have been conducted to investigate how contractual controls can be used and property rights can be distributed to allocate responsibilities for performance outcomes across supply chain actors.

In *Chapter 2*, I study whether supplier shirking in response to uncertainty concerning outcomes can be mitigated by combining performance-based contracting (PBC) and behavior-based contracting (BBC). I distinguish between the contract design and contract management phases. Using a survey data set, I find that buyers can mitigate shirking by combining PBC and BBC during the contract management phase. I find no evidence that combining PBC and BBC during the contract design phase mitigates shirking. Based on these findings I recommend that purchasing managers invest resources in the application of monitoring and evaluation activities to contain adverse behavior by suppliers.

In *Chapter 3*, I study which factors cause the achievement of performance outcomes to be uncertain, and how buyers can attenuate the effects of these factors by engaging in contract management activities. Based on a multiple case study, a conceptual model is developed that explains how outcome uncertainty relates to the roles and activities of buying organizations in the service exchange. Based on these findings I recommend that on the one hand, contract managers need to learn to ‘let go’ and give the supplier room to take its expert role. On the other hand, contract managers need to remain engaged and in touch, in order to facilitate the supplier.

In *Chapter 4*, I study how emotions, which are triggered by a failure to achieve performance outcomes, affect suppliers' future motivation to achieve uncertain performance outcomes. Based on an experimental methodology, I find that in contrast to what previous studies predicted, environmental factors do not decrease the effectiveness of PBC. This is the case because suppliers' managers are hopeful (positive emotion) that the effects thereof will subside. On the other hand, buyers engaging in non-collaborative actions is shown to decrease the effectiveness of PBC since suppliers hold buyers responsible (negative emotion) for performance shortfalls. Based on these findings, I recommend that purchasing managers take into account the emotions that are triggered by context specific factors to determine whether PBC will be effective.

In *Chapter 5*, I study how distributions of property rights associated with selling performance outcomes drive supply chain actors to align their incentives and operational activities. Based on a longitudinal case study, I develop a process model that reveals the specific processes by which alignment occurs both within the manufacturing firm, but also between the manufacturing firm and its customers and suppliers. Based on these findings, I recommend manufacturers' to invest resources in aligning incentives and operations across supply chain actors such that obligations tied to selling performance outcomes can be met.

Taken together, the research presented in this dissertation makes important contributions to theory and practice concerning the use of contractual controls and distributions of property rights to align goals across supply chain actors. In addition, the highlighted recommendations for

practitioners, provide buyers and suppliers with detailed insights concerning how to effectively contract uncertain performance outcomes.

SAMENVATTING

Dit proefschrift draagt bij aan zowel theorie als praktijk door te onderzoeken hoe organisaties onzekere uitkomsten effectief kunnen contracteren.

Het proefschrift doet verslag van vier empirische studies die zijn uitgevoerd om te onderzoeken hoe contractuele controlemechanismen kunnen worden gebruikt en eigendomsrechten kunnen worden verdeeld om verantwoordelijkheden voor prestaties toe te wijzen aan verschillende partijen in de supply chain.

In *hoofdstuk 2* onderzoek ik of opportunistisch gedrag van leveranciers in reactie op onzekerheid rondom uitkomsten kan worden beperkt door performance-based contracting (PBC) en behavior-based contracting (BBC) te combineren. Ik maak onderscheid tussen de fase van contractontwerp en contractbeheer. Gebaseerd op een survey dataset, ontdek ik dat inkopers opportunistisch gedrag kunnen beperken door PBC en BBC te combineren tijdens de contractbeheerfase. Ik vind geen bewijs dat het combineren van PBC en BBC tijdens de contractontwerpfase opportunistisch gedrag vermindert. Op basis van deze bevindingen adviseer ik inkoopmanagers middelen te investeren in de toepassing van monitoring- en evaluatieactiviteiten om opportunistisch gedrag van leveranciers te beperken.

In *hoofdstuk 3* onderzoek ik welke factoren het behalen van prestaties onzeker maken en hoe inkopers de effecten van deze factoren kunnen verminderen door contractbeheeractiviteiten uit te voeren. Op basis van twee casestudies wordt een conceptueel model ontwikkeld dat uitlegt hoe uitkomstonzekerheid verband houdt met de rollen en activiteiten van inkopers. Aan de hand van deze inzichten zou ik contractmanagers erop willen wijzen dat het voor hen van belang is om te leren de leverancier de

ruimte te geven om zijn expertrol te vervullen. Daarnaast is het essentieel dat contractmanagers de leverancier ondersteunen in het leveren van de dienst.

In *hoofdstuk 4* onderzoek ik hoe emoties die veroorzaakt worden door het niet bereiken van prestaties, de toekomstige motivatie van leveranciers beïnvloeden om prestaties te leveren. Aan de hand van een experimentele methodologie, ontdek ik dat in tegenstelling tot wat eerdere studies voorspelden, omgevingsfactoren de effectiviteit van PBC niet verminderen. Dit is het geval omdat leveranciersmanagers hoopvol zijn (positieve emotie) dat de effecten in de toekomst niet zullen spelen. Daarentegen wijst dit onderzoek uit dat belemmerend gedrag van de inkopende partij de effectiviteit van PBC vermindert. Dit is het geval omdat leveranciers de inkopende partij verantwoordelijk stellen (negatieve emotie) voor tekortkomingen in de prestaties. Op basis van deze bevindingen adviseer ik inkoopmanagers rekening te houden met de emoties die worden veroorzaakt door context specifieke factoren om te bepalen of PBC effectief zal zijn.

In *hoofdstuk 5* onderzoek ik hoe verdelingen van eigendomsrechten die samenhangen met het verkopen van prestaties de partijen in de supply chain motiveren om hun operationele activiteiten op elkaar af te stemmen. Op basis van een longitudinale casestudy ontwikkel ik een procesmodel dat de specifieke processen waardoor afstemming plaatsvindt binnen het productiebedrijf, maar ook tussen het productiebedrijf en zijn klanten en leveranciers, beschrijft. Op basis van deze bevindingen beveel ik fabrikanten aan om te investeren in het afstemmen van activiteiten tussen alle actoren in de supply chain. Door deze afstemming zullen leveranciers kunnen voldoen aan de verplichtingen die verbonden zijn aan de prestatieafspraken.

Concluderend kan worden gesteld dat het onderzoek dat in dit proefschrift wordt gepresenteerd belangrijke theoretische en praktische bijdragen levert aan het gebruik van contractuele controlemechanismen en de verdeling van eigendomsrechten om doelen van supply chain actoren op elkaar af te stemmen. Daarnaast geven de besproken aanbevelingen inkopende partijen en leveranciers gedetailleerde informatie over het effectief contracteren van onzekere uitkomsten.

ABOUT THE AUTHOR



Fabian Manfred Edgar Nullmeier was born in the year 1989 in Frankfurt am Main, Germany. He received a Bachelor of Science degree in International Business Administration from Rotterdam School of Management, Erasmus University in 2011. He continued his studies at Erasmus School of Economics and received a Master of Science degree in Accounting, Auditing & Control in 2013. In the same year, he received a Master of Science degree in Supply Chain Management from Rotterdam School of Management, Erasmus University.

In June 2015, Fabian started his PhD in the Supply Chain Management section of the department of Technology and Operations Management at Rotterdam School of Management, Erasmus University under the supervision of Prof. dr. Finn Wynstra and Prof. dr. ir. Erik van Raaij. In his research Fabian focuses on the performance management processes that enable organizations to effectively utilize performance-based contracting in uncertain environments. Fabian's research interests lie at the intersection of performance-based contracting, inter-organizational relationships, and behavioral operations management. During his time as a PhD student Fabian attended several international management conferences to present his research, such as the Academy of Management Conference, Decision Sciences Institute Conference, and International Purchasing and Supply Education and Research Association Conference.

On the 2nd of January 2019, Fabian started working as an Operations Consultant at Berenschot.

PORTFOLIO

PUBLICATIONS AND WORK IN PROGRESS

Nullmeier, F. M. E., Wynstra, F., & van Raaij, E. M. (2016). Outcome attributability in performance-based contracting: Roles and activities of the buying organization. Accepted in the Special Issue on Performance-based Contracting in Industrial Marketing Management.

Nullmeier, F. M. E., Wynstra, F., & Van der Valk, W. Mitigating shirking when contracting performance outcomes in buyer-initiated service triads. Revise and resubmit at Journal of Purchasing and Supply Management.

Wynstra, F., Suurmond, R., Nullmeier, F. M. E. Purchasing and Supply Management as a Multi-Disciplinary Research Field: E Pluribus Unum? Revise and resubmit at Journal of Purchasing and Supply Management.

Nullmeier, F. M. E., Yang, C., & Wynstra, F. Uncovering behavioral effects of causal attributions and attributional biases in performance-based contracting. In preparation for submission to Journal of Supply Chain Management.

Nullmeier, F. M. E., Selviaridis, K., Spring, M., & Van Raaij, E. M. Servitization: how property rights and obligations tied to selling performance outcomes drive manufacturers to engage in a supply chain realignment process. In preparation for submission to Journal of Operations Management.

CONFERENCE PRESENTATIONS

Nullmeier, F. M. E., Selviaridis, K., Spring, M., & Van Raaij, E. M. Rights and obligations associated with selling products as services: How the reallocation of property rights triggers and guides a process of supply chain alignment. In *Operations Management Division Doctoral Consortium, Academy of Management Conference 2018, Chicago, USA*.

Nullmeier, F. M. E., Yang, C. The role of causal attributions in performance pay: Motivational effects of how individuals perceive causes of outcome uncertainty. In *The Third International Symposium on Attribution Theory, Tallahassee, USA*.

Nullmeier, F. M. E., & Wynstra, F. Necessity of hybrid service contracts in service triads: Risk-sharing by using holistic control measures. In *IPSERA 2017 (International Purchasing and Supply Education and Research Association) Conference, Budapest, Hungary*.

Nullmeier, F. M. E., Yang, C. Agency and Attribution theory – Experimental design. In *IPSERA 2017 (International Purchasing and Supply Education and Research Association) Doctoral Workshop, Budapest, Hungary*.

Nullmeier, F. M. E., & Wynstra, F. Are performance-based hybrid contracts necessary? In *DSI 2016 (Decision Sciences Institute) Conference, Austin, USA*.

RESEARCH VISIT

Research visit to Management Science department at Lancaster University Management School (Lancaster, United Kingdom). Visited Prof. dr. Martin Spring and Dr. Kostas Selviaridis to work on a joint research project concerning servitization (Study 4).

TRAINING (DOCTORAL COURSES)

- Behavioral foundations
- Cambridge English proficiency (CPE B)
- Corporate governance
- Developing theory and theoretical contributions
- Empirical Research Methodology & Measurement
- Experimental Methods in Business Research
- Going beyond data synthesis: Meta-analysis for theory advancement in business and economic research
- Interaction performance training/coaching
- Multilevel analysis in SPSS
- Necessary condition analysis: Theory and practice
- Process research methods
- Publishing strategy
- Qualitative methods
- Scientific integrity

TEACHING EXPERIENCE

Rotterdam School of Management, Erasmus University

- 2016-2019* • Course coordinator, Master Course: Strategic sourcing
- 2015-2019* • Coach and Co-reader, Master Theses
- 2015-2018* • Lecturer, Master Course: Research Methodology and Design
- 2015-2018* • Lecturer, Master Course: Healthcare Procurement and Value Chain Management
- 2014-2016* • Teaching Assistant, Master Course: Purchasing and Supply Management

INDUSTRY EXPERIENCE

Berenschot

Utrecht, the Netherlands

JANUARY 2019–PRESENT **Operations Consultant**

- Consulting clients on operational excellence.

The ERIM PhD Series

The ERIM PhD Series contains PhD dissertations in the field of Research in Management defended at Erasmus University Rotterdam and supervised by senior researchers affiliated to the Erasmus Research Institute of Management (ERIM). All dissertations in the ERIM PhD Series are available in full text through the ERIM Electronic Series Portal: <http://repub.eur.nl/pub>. ERIM is the joint research institute of the Rotterdam School of Management (RSM) and the Erasmus School of Economics (ESE) at the Erasmus University Rotterdam (EUR).

Dissertations in the last four years

Akemu, O., *Corporate Responses to Social Issues: Essays in Social Entrepreneurship and Corporate Social Responsibility*, Promoters: Prof. G.M. Whiteman & Dr S.P. Kennedy, EPS-2017-392-ORG, <https://repub.eur.nl/pub/95768>

Alexiou, A. *Management of Emerging Technologies and the Learning Organization: Lessons from the Cloud and Serious Games Technology*, Promoters: Prof. S.J. Magala, Prof. M.C. Schippers and Dr I. Oshri, EPS-2016-404-ORG, <http://repub.eur.nl/pub/93818>

Alserda, G.A.G., *Choices in Pension Management*, Promoters: Prof. S.G. van der Lecq & Dr O.W. Steenbeek, EPS-2017-432-F&A, <https://repub.eur.nl/pub/103496>

Arampatzi, E., *Subjective Well-Being in Times of Crises: Evidence on the Wider Impact of Economic Crises and Turmoil on Subjective Well-Being*, Promoters: Prof. H.R. Commandeur, Prof. F. van Oort & Dr. M.J. Burger, EPS-2018-459-S&E, <https://repub.eur.nl/pub/111830>

Avci, E., *Surveillance of Complex Auction Markets: a Market Policy Analytics Approach*, Promoters: Prof. W. Ketter, Prof. H.W.G.M. van Heck & Prof. D.W. Bunn, EPS-2018-426-LIS, <https://repub.eur.nl/pub/106286>

Balen, T.H. van, *Challenges of Early Stage Entrepreneurs: the Roles of Vision Communication and Team Membership Change*, Promotors: Prof. J.C.M. van den Ende & Dr M. Tarakci, EPS-2019-468-LIS, <https://repub.eur.nl/pub/115654>

Bernoster, I., *Essays at the Intersection of Psychology, Biology, and Entrepreneurship*, Promotors: Prof. A.R. Thurik, Prof. I.H.A. Franken & Prof. P.J.F. Groenen, EPS-2018-463-S&E, <https://repub.eur.nl/pub/113907>

Beusichem, H.C. van, *Firms and Financial Markets: Empirical Studies on the Informational Value of Dividends, Governance and Financial Reporting*, Promotors: Prof. A. de Jong & Dr G. Westerhuis, EPS-2016-378-F&A, <http://repub.eur.nl/pub/93079>

Bouman, P., *Passengers, Crowding and Complexity: Models for Passenger Oriented Public Transport*, Prof. L.G. Kroon, Prof. A. Schöbel & Prof. P.H.M. Vervest, EPS-2017-420-LIS, <https://repub.eur.nl/>

Brazys, J., *Aggregated Macroeconomic News and Price Discovery*, Promotor: Prof. W.F.C. Verschoor, EPS-2015-351-F&A, <http://repub.eur.nl/pub/78243>

Bunderen, L. van, *Tug-of-War: Why and when teams get embroiled in power struggles*, Promotors: Prof. D.L. van Knippenberg & Dr. L. Greer, EPS-2018-446-ORG, <https://repub.eur.nl/pub/105346>

Burg, G.J.J. van den, *Algorithms for Multiclass Classification and Regularized Regression*, Promotors: Prof. P.J.F. Groenen & Dr. A. Alfons, EPS-2018-442-MKT, <https://repub.eur.nl/pub/103929>

Chammas, G., *Portfolio concentration*, Promotor: Prof. J. Spronk, EPS-2017-410-F&E, <https://repub.eur.nl/pub/94975>

Cranenburgh, K.C. van, *Money or Ethics: Multinational corporations and religious organisations operating in an era of corporate responsibility*, Prof. L.C.P.M. Meijs, Prof. R.J.M. van Tulder & Dr D. Arenas, EPS-2016-385-ORG, <http://repub.eur.nl/pub/93104>

Consiglio, I., *Others: Essays on Interpersonal and Consumer Behavior*, Promotor: Prof. S.M.J. van Osselaer, EPS-2016-366-MKT, <http://repub.eur.nl/pub/79820>

Darnihamedani, P. *Individual Characteristics, Contextual Factors and Entrepreneurial Behavior*, Promotors: Prof. A.R. Thurik & S.J.A. Hessels, EPS-2016-360-S&E, <http://repub.eur.nl/pub/93280>

Dennerlein, T. *Empowering Leadership and Employees' Achievement Motivations: the Role of Self-Efficacy and Goal Orientations in the Empowering Leadership Process*, Promotors: Prof. D.L. van Knippenberg & Dr J. Dietz, EPS-2017-414-ORG, <https://repub.eur.nl/pub/98438>

Depecik, B.E., *Revitalizing brands and brand: Essays on Brand and Brand Portfolio Management Strategies*, Promotors: Prof. G.H. van Bruggen, Dr Y.M. van Everdingen and Dr M.B. Ataman, EPS-2016-406-MKT, <http://repub.eur.nl/pub/93507>

Duijzer, L.E., *Mathematical Optimization in Vaccine Allocation*, Promotors: Prof. R. Dekker & Dr W.L. van Jaarsveld, EPS-2017-430-LIS, <https://repub.eur.nl/pub/101487>

El Nayal, O.S.A.N., *Firms and the State: An Examination of Corporate Political Activity and the Business-Government Interface*, Promotor: Prof. J. van Oosterhout & Dr. M. van Essen, EPS-2018-469-S&E, <https://repub.eur.nl/pub/114683>

Erlemann, C., *Gender and Leadership Aspiration: The Impact of the Organizational Environment*, Promotor: Prof. D.L. van Knippenberg, EPS-2016-376-ORG, <http://repub.eur.nl/pub/79409>

Feng, Y., *The Effectiveness of Corporate Governance Mechanisms and Leadership Structure: Impacts on strategic change and firm performance*, Promotors: Prof. F.A.J. van den Bosch, Prof. H.W. Volberda & Dr J.S. Sidhu, EPS-2017-389-S&E, <https://repub.eur.nl/pub/98470>

Fisch, C.O., *Patents and trademarks: Motivations, antecedents, and value in industrialized and emerging markets*, Promotors: Prof. J.H. Block, Prof.

H.P.G. Pennings & Prof. A.R. Thurik, EPS-2016-397-S&E,
<http://repub.eur.nl/pub/94036>

Fliers, P.T., *Essays on Financing and Performance: The role of firms, banks and board*, Promoters: Prof. A. de Jong & Prof. P.G.J. Roosenboom, EPS-2016-388-F&A, <https://repub.eur.nl/pub/93019>

Frick, T.W., *The Implications of Advertising Personalization for Firms, Consumer, and Ad Platforms*, Promoters: Prof. T. Li & Prof. H.W.G.M. van Heck, EPS-2018-452-LIS, <https://repub.eur.nl/pub/110314>

Fytraki, A.T., *Behavioral Effects in Consumer Evaluations of Recommendation Systems*, Promoters: Prof. B.G.C. Dellaert & Prof. T. Li, EPS-2018-427-MKT, <https://repub.eur.nl/pub/110457>

Gaast, J.P. van der, *Stochastic Models for Order Picking Systems*, Promoters: Prof. M.B.M de Koster & Prof. I.J.B.F. Adan, EPS-2016-398-LIS, <http://repub.eur.nl/pub/93222>

Ghazizadeh, P. *Empirical Studies on the Role of Financial Information in Asset and Capital Markets*, Promoters: Prof. A. de Jong & Prof. E. Peek, EPS-2019-470-F&A, <https://repub.eur.nl/pub/114023>

Giurge, L., *A Test of Time; A temporal and dynamic approach to power and ethics*, Promoters: Prof. M.H. van Dijke & Prof. D. De Cremer, EPS-2017-412-ORG, <https://repub.eur.nl/pub/98451>

Gobena, L., *Towards Integrating Antecedents of Voluntary Tax Compliance*, Promoters: Prof. M.H. van Dijke & Dr P. Verboon, EPS-2017-436-ORG, <https://repub.eur.nl/pub/103276>

Groot, W.A., *Assessing Asset Pricing Anomalies*, Promoters: Prof. M.J.C.M. Verbeek & Prof. J.H. van Binsbergen, EPS-2017-437-F&A, <https://repub.eur.nl/pub/103490>

Hanselaar, R.M., *Raising Capital: On pricing, liquidity and incentives*, Promoters: Prof. M.A. van Dijk & Prof. P.G.J. Roosenboom, EPS-2018-429-F&A-9789058925404, <https://repub.eur.nl/pub/113274>

Harms, J. A., *Essays on the Behavioral Economics of Social Preferences and Bounded Rationality*, Prof. H.R. Commandeur & Dr K.E.H. Maas, EPS-2018-457-S&E, <https://repub.eur.nl/pub/108831>

Hendriks, G., *Multinational Enterprises and Limits to International Growth: Links between Domestic and Foreign Activities in a Firm's Portfolio*, Promoters: Prof. P.P.M.A.R. Heugens & Dr. A.H.L. Slangen, EPS-2019-464-S&E, <https://repub.eur.nl/pub/114981>

Hengelaar, G.A., *The Proactive Incumbent: Holy grail or hidden gem? Investigating whether the Dutch electricity sector can overcome the incumbent's curse and lead the sustainability transition*, Promoters: Prof. R.J. M. van Tulder & Dr K. Dittich, EPS-2018-438-ORG, <https://repub.eur.nl/pub/102953>

Jacobs, B.J.D., *Marketing Analytics for High-Dimensional Assortments*, Promoters: Prof. A.C.D. Donkers & Prof. D. Fok, EPS-2017-445-MKT, <https://repub.eur.nl/pub/103497>

Kahlen, M. T., *Virtual Power Plants of Electric Vehicles in Sustainable Smart Electricity Markets*, Promoters: Prof. W. Ketter & Prof. A. Gupta, EPS-2017-431-LIS, <https://repub.eur.nl/pub/100844>

Kampen, S. van, *The Cross-sectional and Time-series Dynamics of Corporate Finance: Empirical evidence from financially constrained firms*, Promoters: Prof. L. Norden & Prof. P.G.J. Roosenboom, EPS-2018-440-F&A, <https://repub.eur.nl/pub/105245>

Karali, E., *Investigating Routines and Dynamic Capabilities for Change and Innovation*, Promoters: Prof. H.W. Volberda, Prof. H.R. Commandeur and Dr J.S. Sidhu, EPS-2018-454-S&E, <https://repub.eur.nl/pub/106274>

Keko, E., *Essays on Innovation Generation in Incumbent Firms*, Promoters: Prof. S. Stremersch & Dr N.M.A. Camacho, EPS-2017-419-MKT, <https://repub.eur.nl/pub/100841>

Kerkkamp, R.B.O., *Optimisation Models for Supply Chain Coordination under Information Asymmetry*, Promoters: Prof. A.P.M. Wagelmans & Dr. W. van den Heuvel, EPS-2018-462-LIS

Khattab, J., *Make Minorities Great Again: a contribution to workplace equity by identifying and addressing constraints and privileges*, Promoters: Prof. D.L. van Knippenberg & Dr A. Nederveen Pieterse, EPS-2017-421-ORG, <https://repub.eur.nl/pub/99311>

Kim, T. Y., *Data-driven Warehouse Management in Global Supply Chains*, Promoters: Prof. R. Dekker & Dr C. Heij, EPS-2018-449-LIS, <https://repub.eur.nl/pub/109103>

Klitsie, E.J., *Strategic Renewal in Institutional Contexts: The paradox of embedded agency*, Promoters: Prof. H.W. Volberda & Dr. S. Ansari, EPS-2018-444-S&E, <https://repub.eur.nl/pub/106275>

Koolen, D., *Market Risks and Strategies in Power Systems Integrating Renewable Energy*, Promoters: Prof. W. Ketter & Prof. R. Huisman, EPS-2019-467-LIS, <https://repub.eur.nl/pub/115655>

Kong, L. *Essays on Financial Coordination*, Promoters: Prof. M.J.C.M. Verbeek, Dr. D.G.J. Bongaerts & Dr. M.A. van Achter. EPS-2019-433-F&A, <https://repub.eur.nl/pub/114516>

Krämer, R., *A license to mine? Community organizing against multinational corporations*, Promoters: Prof. R.J.M. van Tulder & Prof. G.M. Whiteman, EPS-2016-383-ORG, <http://repub.eur.nl/pub/94072>

Lee, C.I.S.G., *Big Data in Management Research: Exploring New Avenues*, Promoters: Prof. S.J. Magala & Dr W.A. Felps, EPS-2016-365-ORG, <http://repub.eur.nl/pub/79818>

Li, X. *Dynamic Decision Making under Supply Chain Competition*, Promoters: Prof. M.B.M de Koster, Prof. R. Dekker & Prof. R. Zuidwijk. EPS-2018-466-LIS, <https://repub.eur.nl/pub/114028>

Liu, N., *Behavioral Biases in Interpersonal Contexts*, Supervisors: Prof. A. Baillon & Prof. H. Bleichrodt, EPS-2017-408-MKT, <https://repub.eur.nl/pub/95487>

Ma, Y., *The Use of Advanced Transportation Monitoring Data for Official Statistics*, Promotors: Prof. L.G. Kroon & Dr J. van Dalen, EPS-2016-391-LIS, <http://repub.eur.nl/pub/80174>

Maira, E., *Consumers and Producers*, Promotors: Prof. S. Puntoni & Prof. C. Fuchs, EPS-2018-439-MKT, <https://repub.eur.nl/pub/104387>

Meulen, van der, D., *The Distance Dilemma: the effect of flexible working practices on performance in the digital workplace*, Promotors: Prof. H.W.G.M. van Heck & Prof. P.J. van Baalen, EPS-2016-403-LIS, <http://repub.eur.nl/pub/94033>

Moniz, A., *Textual Analysis of Intangible Information*, Promotors: Prof. C.B.M. van Riel, Prof. F.M.G de Jong & Dr G.A.J.M. Berens, EPS-2016-393-ORG, <http://repub.eur.nl/pub/93001>

Mulder, J. *Network design and robust scheduling in liner shipping*, Promotors: Prof. R. Dekker & Dr W.L. van Jaarsveld, EPS-2016-384-LIS, <http://repub.eur.nl/pub/80258>

Neerijnen, P., *The Adaptive Organization: the socio-cognitive antecedents of ambidexterity and individual exploration*, Promotors: Prof. J.J.P. Jansen, P.P.M.A.R. Heugens & Dr T.J.M. Mom, EPS-2016-358-S&E, <http://repub.eur.nl/pub/93274>

Okbay, A., *Essays on Genetics and the Social Sciences*, Promotors: Prof. A.R. Thurik, Prof. Ph.D. Koellinger & Prof. P.J.F. Groenen, EPS-2017-413-S&E, <https://repub.eur.nl/pub/95489>

Oord, J.A. van, *Essays on Momentum Strategies in Finance*, Promotor: Prof. H.K. van Dijk, EPS-2016-380-F&A, <http://repub.eur.nl/pub/80036>

Peng, X., *Innovation, Member Sorting, and Evaluation of Agricultural Cooperatives*, Promotor: Prof. G.W.J. Hendriks, EPS-2017-409-ORG, <https://repub.eur.nl/pub/94976>

Pennings, C.L.P., *Advancements in Demand Forecasting: Methods and Behavior*, Promoters: Prof. L.G. Kroon, Prof. H.W.G.M. van Heck & Dr J. van Dalen, EPS-2016-400-LIS, <http://repub.eur.nl/pub/94039>

Petruchenya, A., *Essays on Cooperatives: Emergence, Retained Earnings, and Market Shares*, Promoters: Prof. G.W.J. Hendriks & Dr Y. Zhang, EPS-2018-447-ORG, <https://repub.eur.nl/pub/105243>

Plessis, C. du, *Influencers: The Role of Social Influence in Marketing*, Promoters: Prof. S. Puntoni & Prof. S.T.L.R. Sweldens, EPS-2017-425-MKT, <https://repub.eur.nl/pub/103265>

Pocock, M., *Status Inequalities in Business Exchange Relations in Luxury Markets*, Promoters: Prof. C.B.M. van Riel & Dr G.A.J.M. Berens, EPS-2017-346-ORG, <https://repub.eur.nl/pub/98647>

Pozharliev, R., *Social Neuromarketing: The role of social context in measuring advertising effectiveness*, Promoters: Prof. W.J.M.I. Verbeke & Prof. J.W. van Strien, EPS-2017-402-MKT, <https://repub.eur.nl/pub/95528>

Reh, S.G., *A Temporal Perspective on Social Comparisons in Organizations*, Promoters: Prof. S.R. Giessner, Prof. N. van Quaquebeke & Dr. C. Troster, EPS-2018-471-ORG, <https://repub.eur.nl/pub/114522>

Riessen, B. van, *Optimal Transportation Plans and Portfolios for Synchromodal Container Networks*, Promoters: Prof. R. Dekker & Prof. R.R. Negenborn, EPS-2018-448-LIS, <https://repub.eur.nl/pub/105248>

Roza, L., *Employee Engagement in Corporate Social Responsibility: A collection of essays*, Promotor: Prof. L.C.P.M. Meijs, EPS-2016-396-ORG, <http://repub.eur.nl/pub/93254>

Schie, R. J. G. van, *Planning for Retirement: Save More or Retire Later?* Promoters: Prof. B. G. C. Dellaert & Prof. A.C.D. Donkers, EOS-2017-415-MKT, <https://repub.eur.nl/pub/100846>

Schouten, K.I.M. *Semantics-driven Aspect-based Sentiment Analysis*, Promoters: Prof. F.M.G. de Jong, Prof. R. Dekker & Dr. F. Frasincaar, EPS-2018-453-LIS, <https://repub.eur.nl/pub/112161>

Schouten, M.E., *The Ups and Downs of Hierarchy: the causes and consequences of hierarchy struggles and positional loss*, Promotors; Prof. D.L. van Knippenberg & Dr. L.L. Greer, EPS-2016-386-ORG, <http://repub.eur.nl/pub/80059>

Smit, J. *Unlocking Business Model Innovation: A look through the keyhole at the inner workings of Business Model Innovation*, Promotor: Prof. H.G. Barkema, EPS-2016-399-S&E, <http://repub.eur.nl/pub/93211>

Straeter, L.M., *Interpersonal Consumer Decision Making*, Promotors: Prof. S.M.J. van Osselaer & Dr I.E. de Hooge, EPS-2017-423-MKT, <https://repub.eur.nl/pub/100819>

Stuppy, A., *Essays on Product Quality*, Promotors: Prof. S.M.J. van Osselaer & Dr. N.L. Mead. EPS-2018-461-MKT, <https://repub.eur.nl/pub/111375>

Subaşı, B., *Demographic Dissimilarity, Information Access and Individual Performance*, Promotors: Prof. D.L. van Knippenberg & Dr W.P. van Ginkel, EPS-2017-422-ORG, <https://repub.eur.nl/pub/103495>

Suurmond, R., *In Pursuit of Supplier Knowledge: Leveraging capabilities and dividing responsibilities in product and service contexts*, Promotors: Prof. J.Y.F Wynstra & Prof. J. Dul. EPS-2018-475-LIS, <https://repub.eur.nl/pub/115138>

Szatmari, B., *We are (all) the champions: The effect of status in the implementation of innovations*, Promotors: Prof. J.C.M van den Ende & Dr D. Deichmann, EPS-2016-401-LIS, <http://repub.eur.nl/pub/94633>

Toxopeus, H.S. *Financing sustainable innovation: From a principal-agent to a collective action perspective*, Promotors: Prof. H.R. Commandeur & Dr. K.E.H. Maas. EPS-2019-458-S&E, <https://repub.eur.nl/pub/114018>

Turturea, R., *Overcoming Resource Constraints: The Role of Creative Resourcing and Equity Crowdfunding in Financing Entrepreneurial Ventures*, Promotors: Prof. P.P.M.A.R Heugens, Prof. J.J.P. Jansen & Dr. I. Verheuil, EPS-2019-472-S&E, <https://repub.eur.nl/pub/112859>

Valogianni, K., *Sustainable Electric Vehicle Management using Coordinated Machine Learning*, Promotors: Prof. H.W.G.M. van Heck & Prof. W. Ketter, EPS-2016-387-LIS, <http://repub.eur.nl/pub/93018>

Vandic, D., *Intelligent Information Systems for Web Product Search*, Promotors: Prof. U. Kaymak & Dr Frasincar, EPS-2017-405-LIS, <https://repub.eur.nl/pub/95490>

Verbeek, R.W.M., *Essays on Empirical Asset Pricing*, Promotors: Prof. M.A. van Dijk & Dr M. Szymanowska, EPS-2017-441-F&A, <https://repub.eur.nl/pub/102977>

Versluis, I., *Prevention of the Portion Size Effect*, Promotors: Prof. Ph.H.B.F. Franses & Dr E.K. Papies, EPS-2016-382-MKT, <http://repub.eur.nl/pub/79880>

Vishwanathan, P., *Governing for Stakeholders: How Organizations May Create or Destroy Value for their Stakeholders*, Promotors: Prof. J. van Oosterhout & Prof. L.C.P.M. Meijs, EPS-2016-377-ORG, <http://repub.eur.nl/pub/93016>

Vlaming, R. de., *Linear Mixed Models in Statistical Genetics*, Prof. A.R. Thurik, Prof. P.J.F. Groenen & Prof. Ph.D. Koellinger, EPS-2017-416-S&E, <https://repub.eur.nl/pub/100428>

Vries, H. de., *Evidence-Based Optimization in Humanitarian Logistics*, Promotors: Prof. A.P.M. Wagelmans & Prof. J.J. van de Klundert, EPS-2017-435-LIS, <https://repub.eur.nl/pub/102771>

Wagenaar, J.C., *Practice Oriented Algorithmic Disruption Management in Passenger Railways*, Prof. L.G. Kroon & Prof. A.P.M. Wagelmans, EPS-2016-390-LIS, <http://repub.eur.nl/pub/93177>

Wang, P., *Innovations, status, and networks*, Promotors: Prof. J.J.P. Jansen & Dr V.J.A. van de Vrande, EPS-2016-381-S&E, <http://repub.eur.nl/pub/93176>

Wang, R., *Corporate Environmentalism in China*, Promoters: Prof. P.P.M.A.R Heugens & Dr F. Wijen, EPS-2017-417-S&E, <https://repub.eur.nl/pub/99987>

Wasesa, M., *Agent-based inter-organizational systems in advanced logistics operations*, Promoters: Prof. H.W.G.M van Heck, Prof. R.A. Zuidwijk & Dr A. W. Stam, EPS-2017-LIS-424, <https://repub.eur.nl/pub/100527>

Wessels, C., *Flexible Working Practices: How Employees Can Reap the Benefits for Engagement and Performance*, Promoters: Prof. H.W.G.M. van Heck, Prof. P.J. van Baalen & Prof. M.C. Schippers, EPS-2017-418-LIS, <https://repub.eur.nl/>

Wiegmann, P.M., *Setting the Stage for Innovation: Balancing Diverse Interests through Standardisation*, Promoters: Prof. H.J. de Vries & Dr. K. Blind, EPS-2019-473-LIS, <https://repub.eur.nl/pub/114519>

Williams, A.N., *Make Our Planet Great Again: A Systems Perspective of Corporate Sustainability*, Promoters: Prof. G.M. Whiteman & Dr. S. Kennedy, EPS-2018-456-ORG, <https://repub.eur.nl/pub/111032>

Witte, C.T., *Bloody Business: Multinational investment in an increasingly conflict-afflicted world*, Promoters: Prof. H.P.G. Pennings, Prof. H.R. Commandeur & Dr M.J. Burger, EPS-2018-443-S&E, <https://repub.eur.nl/pub/104027>

Yuan, Y., *The Emergence of Team Creativity: a social network perspective*, Promoters: Prof. D. L. van Knippenberg & Dr D. A. Stam, EPS-2017-434-ORG, <https://repub.eur.nl/pub/100847>

Ypsilantis, P., *The Design, Planning and Execution of Sustainable Intermodal Port-hinterland Transport Networks*, Promoters: Prof. R.A. Zuidwijk & Prof. L.G. Kroon, EPS-2016-395-LIS, <http://repub.eur.nl/pub/94375>

Yuferova, D. *Price Discovery, Liquidity Provision, and Low-Latency Trading*, Promoters: Prof. M.A. van Dijk & Dr D.G.J. Bongaerts, EPS-2016-379-F&A, <http://repub.eur.nl/pub/93017>

Zhang, Q., *Financing and Regulatory Frictions in Mergers and Acquisitions*, Promoters: Prof. P.G.J. Roosenboom & Prof. A. de Jong, EPS-2018-428-F&A, <https://repub.eur.nl/pub/103871>

Zuber, F.B., *Looking at the Others: Studies on (un)ethical behavior and social relationships in organizations*, Promotor: Prof. S.P. Kaptein, EPS-2016-394-ORG, <http://repub.eur.nl/pub/94388>

This dissertation contributes to practice and literature by studying how organizations can effectively contract and sell uncertain performance outcomes. In Chapter 2, I study whether supplier shirking in response to outcome uncertainty can be mitigated by combining performance and behavior specification and evaluation. Based on the findings of this study, I advise purchasing managers to invest in the evaluation of performance and behavior to contain suppliers' opportunistic behavior. In Chapter 3, I study what causes performance achievement to be uncertain, and how buyers can attenuate the effects. Based on the findings, I explain that outcome uncertainty is related to the roles and activities of buying organizations in the service exchange. To remedy the negative effects, I advise buyers to coordinate relevant activities of their organization with suppliers. In Chapter 4, I study how emotions, which are triggered by a failure to achieve performance outcomes, affect suppliers' future motivation. Based on the findings, I advise purchasing managers to take into account the context specific factors and resulting emotions in determining when and how to use performance-based contracting. In Chapter 5, I study the supply chain-wide implications of acquiring property rights and obligations associated with selling performance outcomes. Based on the findings, I advise manufacturers to minimize the subsequent financial risks by investing resources in the alignment of incentives and operations across supply chain actors. Overall, this dissertation makes important theoretical advancements concerning goal alignment across supply chain actors through the use of contractual controls and distributions of property rights.

ERIM

The Erasmus Research Institute of Management (ERIM) is the Research School (Onderzoekschool) in the field of management of the Erasmus University Rotterdam. The founding participants of ERIM are the Rotterdam School of Management (RSM), and the Erasmus School of Economics (ESE). ERIM was founded in 1999 and is officially accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW). The research undertaken by ERIM is focused on the management of the firm in its environment, its intra- and interfirm relations, and its business processes in their interdependent connections.

The objective of ERIM is to carry out first rate research in management, and to offer an advanced doctoral programme in Research in Management. Within ERIM, over three hundred senior researchers and PhD candidates are active in the different research programmes. From a variety of academic backgrounds and expertises, the ERIM community is united in striving for excellence and working at the forefront of creating new business knowledge.



ERIM PhD Series Research in Management

Erasmus University Rotterdam (EUR)
Erasmus Research Institute of Management
Mandeville (T) Building
Burgemeester Oudlaan 50
3062 PA Rotterdam, The Netherlands

P.O. Box 1738
3000 DR Rotterdam, The Netherlands
T +31 10 408 1182
E info@erim.eur.nl
W www.erim.eur.nl