Fostering Innovation through Contracting in Inter-Organizational Relationships

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Sumo, Regien

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Keywords: innovation, contract, performance-based contract, inter-organizational relationship, formal governance, relational governance, transaction cost economics, agency theory, autonomy, term specificity, pay-for-performance, risk-aversion, goodwill trust, competence trust

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Fostering Innovation through Contracting in Inter-Organizational Relationships

PROEFSCHRIFT

Ten verkrijging van de graad van doctor aan de Technische universiteit Eindhoven, op gezag van de rector magnificus, prof.dr.ir. C.J. van Duijn, voor een commissie aangewezen door het College voor Promoties in het openbaar te verdedigen op dinsdag 16 december 2014 om 16.00 uur

door

Regien Sumo

geboren te Zakho, Irak
Dit proefschrift is goedgekeurd door de promotoren en de samenstelling van de promotiecommissie is als volgt:

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       prof.dr.ir. G.J.J.A.N. van Houtum
       prof.dr. F. Langerak
‘In the moment it is hard to see how a particular moment in your life makes sense. But looking back many years later, you’ll often be able to connect the dots and see how everything you went through was critical in leading you to the place you are now.’

- Steve Jobs, 2005 -
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Eindhoven, 2014
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CHAPTER 1

Introduction\textsuperscript{1,2}

Researchers have suggested that performance-based contracts (PBCs), which are predominantly used in the context of partnering with an organization that delivers services, might have a positive effect on innovation. PBCs describe the performance to be delivered by the partner rather than the inputs and processes. Though several authors have acknowledged the positive effects of such contracts on innovation, none of the studies empirically research how this effect occurs. In addition, despite the large amount of research on relational governance methods, there is little consensus on the relationship between trust, contracts, and innovation. Therefore, this dissertation’s focus is, first on the relationship between PBCs, and innovation, and second on which combinations of contract and trust are necessary but not sufficient conditions for achieving innovation.

\textsuperscript{1} Parts of this chapter are based on: Sumo, R., Duysters, G., Van der Valk, W., & Van Weele, A. (2014). Incomplete Contracting in Strategic Alliances: The Quest for Innovation, in the book: Strategic Alliances for Innovation and R&D by T. K. Das (Ed.).

\textsuperscript{2} The majority of the work in this chapter has been done by the author (principal researcher) of this dissertation. The feedback from the promotors and co-promotors during several revision rounds has been implemented.
1.1. Introduction

Recently, organizations focus less on contracting for a product, rather the focus has shifted towards contracting augmented services surrounding that product. In these situations, a capital equipment manufacturer earns its profit not by transferring the ownership of the equipment to the client (i.e., selling a product), but through selling a predetermined level of availability of that equipment by e.g., leasing and providing maintenance and managing spare parts on that equipment. Think for example of Rolls-Royce Aerospace that, rather than selling its aero engines, offers a total care package where the client contracts for the uptime of the engine (also known as “power by the hour”) (Cohen, Agrawal, & Agrawal, 2006; Neeley, 2009; Ng et al., 2009). This change from goods orientation towards service orientation (i.e., servitization) has transformed the way organizations engage in inter-organizational relationships (IORs).

Such IORs emphasize the external partner’s (e.g., supplier’s) role of being more proactive in the service delivery and engaging in innovation. Because of the shift in new ways of collaborating, both parties in the IOR have the need to use new ways of contracting, as traditional contracts (e.g., fixed price and cost plus contracts) will not be successful when contracting for service oriented offerings. These traditional contracts are merely focused on achieving lowest costs, rather than focusing on additional values that could be created within IORs. An alternative would be to use contracts that focus on the performance of the service delivered by the partner rather than the processes and inputs. Performance-based contracts (PBCs) are an example of such contracts used in service oriented IORs, which explicitly describe the performance that should be delivered (e.g., the uptime percentage). Recently, PBCs have gained

---

3 An IOR can take many forms, such as joint ventures, joint production, contracted R&D, and a long term buyer-seller relationship. In this dissertation, we address our research question from an intra-IOR perspective. Thus: ‘focal firm’ refers to an organization within the IOR (e.g., a buyer), and ‘partner’ refers to the partner of that focal firm (e.g., a seller). Finally, ‘parties’ refers to the two organizations that are part of the IOR (e.g., the buyer and the seller that form the IOR).
popularity among organizations as these contracts are said to foster innovation and align the interests of both parties due to the focus on outcomes. However, business practices show that such contracts are not always successful and do not always result in the performance that the partner was expected to deliver. Often, the IORs are faced with opportunistic behavior, miscommunication and unintended knowledge spillovers (Faems et al., 2005; Williamson, 1985). This might eventually result in dissolving the IOR. This raises the challenge of how the business interest of the parties should be aligned in IORs where the focus is on contracting for integrated services. What contracts should be used and what is the role of PBCs in this respect? What are the key characteristics of PBCs that differentiates them from traditional contracts (e.g., fixed price and cost plus contracts)? How should organizations design such contracts to make them successful in terms of fostering innovation? When should organizations use these contracts?

These questions are critical for organizations that aim for a successful collaboration (in terms of innovation) with external partners, which is why they will be addressed in this dissertation. In this chapter, the research background of this dissertation is discussed, followed by laying out the research focus and research questions. Finally, this chapter elaborates on the research strategies and discusses the separate research studies.

1.2. Research Background

Innovation (both radical and incremental) in products and services is critical for firms to gain and sustain competitive advantage and is seen as crucial for the long-term survival of an organization (Brown & Eisenhardt, 1995; Faems et al., 2005; Hecker & Ganter, 2013; Hollen et al., 2013). Organizations can engage in innovation through internal innovation activities, such as internal development and R&D. However, being focused on their own innovative capabilities limits
the organization in responding to changing environments. Organizations do not have all the necessary resources to succeed in complex environments. Furthermore, organizations face difficulties when trying to capture the value of their own resources; as a result, the full value potential remains underexploited (Chesbrough, 2006). Finally, internal innovation practices, like R&D, do not fit the current needs of organizations as they are characterized by high costs and risks, slow time-to-market and inflexibility (Vanhaverbeke et al., 2008).

As firms are no longer able to solely rely on internal innovation, external partners have become an increasingly important source of innovative solutions, ideas, and technologies (Chesbrough et al., 2008). IORs have thus become important in complementing organizations’ internal innovation strategies. Moreover, IORs are thought to enhance or even drive innovation (Faems et al., 2005; Goes & Park, 1997; Hamel, 1991; Teece et al., 1997).

Nevertheless, despite the positive effects of IORs, according to transaction cost economics (TCE) and agency theory (AT), the IOR may suffer from opportunistic behavior or coordination failures that impede the efforts of even well-intentioned parties. These hazards might inhibit innovation if they are not governed properly. To mitigate these hazards, organizations use governance mechanisms, which refer to the formal and informal rules of exchange between parties in an IOR (Griffith & Myers, 2005; Vandaele et al., 2007). In general, two governance mechanisms have been used in IORs: formal governance such as contracts, and relational governance such as trust (Griffith & Myers, 2005). Contractual governance is considered a formal, legal, and economic governance mechanism which is defined as the degree to which a formal contract is established in IORs (Ferguson et al., 2005; Gardet & Mothe, 2011). Whereas formal agreements may take various forms (written or verbal, implicit or explicit), contracts are written agreements that are legally binding (Woolthuis, Hillebrand, & Nooteboom, 2005). Relational governance refers to the strength of the social norms present in an IOR (Ferguson et al., 2005). It does not only
focus on the relationship orientation of both parties, but also emphasizes exchange behaviors and norms (Vandaele et al., 2007). Ever since the importance of relational governance has been emphasized in IORs, researchers have focused on relational governance (Sharma & Pillai, 2003; Vandaele et al., 2007). In contrast, relatively few studies focus on contractual governance (Vandaele et al., 2007). Researchers and practitioners consider contracts merely being a safeguarding mechanism rather than acknowledging that contracts could also serve other functions and could affect IOR outcomes.

Table 1.1A gives an overview of the key empirical studies conducted on the effects of contractual and relational governance on performance and innovation in IORs. This table illustrates that previous research mainly focuses on the effects of relational governance on performance outcomes such as sales growth, market share, competitiveness, and goal achievements (Dyer & Singh, 1998; Johnston et al., 2004; Lavie et al., 2012; Saxton, 1997; Zaheer et al., 1998). In these studies, innovation has rarely been adopted as the performance outcome to be studied, as shown in Table 1.1B where the effect sizes are also presented. As put forward by recent studies, there is a scarcity of research that focuses on performance implications of contracts (Anderson & Dekker, 2005; Schepker et al., 2014), especially in relation to innovation. As a result, more research is needed on the effects of contracts on innovation.

---

4 Note that a large amount of research has been conducted in the legal literature. However, given our focus on the behavioral outcomes of contracts and the fact that we had to delineate our literature, the focus in this dissertation is only on managerial/business literature.

5 We did collect the effect sizes of performance outcomes in table 1.1A. However, these papers measured relational/contractual governance and performance outcomes in different ways and sometimes used multiple variables for one construct (e.g., trust, communication and commitment for relational governance). It seems that there is not an overall conclusion available as to if and how contractual and formal governance affect performance outcomes. Several papers contained more than 10 effect sizes. To keep the table readable, we did not insert the effect sizes here.
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Noordewier et al., (1990)</td>
<td>Survey, 483, 29%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mohr &amp; Spekman (1994)</td>
<td>Survey, 557, 25%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aulakh et al., (1996)</td>
<td>Survey, 652, 39.4%, S</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siguaw et al., (1998)</td>
<td>Survey, 1127, 36.9%, B &amp; S</td>
<td>USA</td>
<td>Neg &amp; Pos.***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luo (2002)</td>
<td>Survey, 800, 36.36%, JVE</td>
<td>China</td>
<td>Pos.**</td>
<td>Inv.U**</td>
<td>Pos.**(C)</td>
</tr>
<tr>
<td>Poppo &amp; Zenger (2002)</td>
<td>Survey, 3000, 9.5%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td>Pos.**</td>
<td>Pos.**(C)</td>
</tr>
<tr>
<td>Bello et al., (2003)</td>
<td>Survey, 402, 72%, S</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zhang et al., (2003)</td>
<td>Survey, 623, 22.6%, S</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lui and Ngo (2004)</td>
<td>Survey, 265, 33%, B</td>
<td>Hong Kong</td>
<td></td>
<td></td>
<td>Neg. &amp; Pos.**(CS)</td>
</tr>
<tr>
<td>Ferguson et al., (2005)</td>
<td>Structured interviews, 160, B&amp;S</td>
<td>USA, Can, Mex</td>
<td>Pos.**</td>
<td>Pos.**</td>
<td></td>
</tr>
<tr>
<td>Griffith &amp; Myers, (2005)</td>
<td>Survey, 500, 20.4%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krishnan et al., (2006)</td>
<td>Survey, 700, 18%, AE</td>
<td>Ind</td>
<td>Post.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paulraj et al., (2008)</td>
<td>Survey, 954, 23.2%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 1.1B: Overview of Literature on effects of Contractual and Relational Governance on Innovation with Effect Sizes

<table>
<thead>
<tr>
<th>Empirical Study</th>
<th>Research Design, Sample, Response rate, Respondent(^a)</th>
<th>Country(^b)</th>
<th>RG-Perf./Innov.(^c)</th>
<th>CG-Perf./Innov.(^c)</th>
<th>CG&amp;RG-Perf./Innov.(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang et al. (2011)</td>
<td>Survey, 850, 71.41%, B</td>
<td>China</td>
<td>Trust: 0.34**</td>
<td>Innov. U: 0.1** / -0.29** (S): -0.38**</td>
<td>Innov., Eff. Size</td>
</tr>
</tbody>
</table>

\(^a\) AE=alliance executive; B=buyer, S=supplier, JVE=joint venture executive.
\(^b\) Arg=Argentina; Can=Canada; Den=Denmark; Fra=France; Ger=Germany; Neth=Netherlands; 19&8=multiple countries.
\(^c\) RG=relational governance; CG=contractual governance; perf=performance; innov=innovation

---

**Pos.**=hypothesized positive relationship; **neg.**=hypothesized negative relationship; **inv. U**=hypothesized inverse-U relationship

\(*=partly significant; **=significant; NO star=no significant relationship; (C)=complements; (S)=substitutes; (CS)=complements and substitutes**
1.3. **Research Focus and Research Questions**

The review of the inter-firm governance literature related to performance outcomes showed that existing research hardly focuses on the effects of contracts on innovation yet. Insights from this literature can be used to formulate the research gap and the resulting research questions, which will be laid out in the following section.

1.3.1. **The Role of (in)Complete Contracts in Achieving Innovation**

Parties incorporate contracts to prescribe roles and obligations, determine the content of the inter-firm exchange and the distribution of outcomes and specify rewards and penalties for violating contractual agreements (Huang et al., 2014; Wang et al., 2011). Contracts state how future situations should be dealt with, thereby decreasing uncertainty about behavior and outcomes by providing formal rules and procedures to maintain the collaboration. Hence, contracts narrow the domain and severity of risk to which an exchange is exposed to and thereby encourage subsequent cooperation (Wang et al., 2011).

TCE and AT indicate that organizations should design contracts that take into account transaction characteristics such as frequency, asset specificity, environmental and behavioral uncertainty, and task complexity (Anderson & Dekker, 2005; Chen & Bharadwaj, 2009; Williamson, 1979). The higher the degree of these transaction characteristics, the more detailed (i.e., complete)⁶ a contract needs to be to minimize risks. Complete contracts are contingent on all events that are relevant to the fulfillment of the contract and they represent what organizations could stipulate in a contract in a world in which all future events can be foreseen (Saussier, 2000).

Nevertheless, TCE suggests that contracts are inevitably incomplete (Mayer & Argyres, 2004) albeit in different degrees. Incomplete contracts do not specify all observable obligations and actions of both parties (Bernheim &

---

⁶ In this dissertation, contractual detail and contractual completeness are used interchangeably.
Whinston, 1998). Two common views explain the observation that contracts are inevitably incomplete. First, parties are subject to bounded rationality; that is they are not able to specify all terms and clauses (Aghion & Holden, 2011; Tirole, 1999). Moreover, nowadays it is even more difficult to write complete contracts as organizations are facing turbulent environments due to e.g., globalization and rapid change of market demands, which makes it more difficult to capture all events in contractual clauses. Second, organizations balance ex-ante costs (e.g., searching for information to draft detailed contracts) of designing complete contracts with the ex-post costs (e.g., opportunistic behavior) of less exhaustive arrangements (Crocker & Masten, 1991).

The problem with incomplete contracts, compared to more detailed contracts, is that they do not sufficiently address the transaction characteristics that may result in opportunistic behavior (Goldberg, 1976, 1985; Williamson, 1985). Nevertheless, incomplete contracts offer two important benefits over more detailed contracts. Incomplete contracts are characterized by flexibility and they allow more freedom for the partner to decide how to deliver the transaction because such contracts are more open (Bernheim & Whinston, 1998; Luo, 2002). Whereas the detailed nature of more complete contracts may constrain innovation due to the detailed specification of what is and is not allowed (Hart, 1989; Wang et al., 2011), it is the freedom of incomplete contracts that is expected to allow room for the partner to engage in innovation. Specifically, researchers have suggested that a specific type of incomplete contract, i.e., performance-based contracts (PBCs) which are predominantly used in the context of partnering with an organization that delivers services, might have a positive effect on innovation (Kim et al., 2007; Martin, 2002; Ng & Nudurupati, 2010). A PBC is a contract that underlines the outcome of the transaction rather than prescribing how to perform the transaction or which resources to use (Kim et al., 2007). Because PBCs focus on the desired performance, they contain less contractual detail regarding the specification of
processes, behaviors and inputs: consequently, PBCs are relatively more incomplete than many other contract types, such as fixed fee and cost-plus contracts. By allowing the partner to determine how to best accomplish the work, PBCs strive to increase the innovative behavior of the partner (Kim et al., 2007; Martin, 2002; Ng, Maull, & Yip, 2009). For this reason, PBCs are increasingly applied in practice, in both the public (government, healthcare) and private (logistics, maintenance) sectors. In this dissertation, innovation in the context of a contract is defined as partner-initiated, proactive undertakings that result in new or improved ways of delivering services (Johnson & Medcof, 2007). The key aspect of this definition is that the focal organization (e.g., buyer) taps into the partner’s (e.g., supplier) entrepreneurial ideas (Shimizu, 2012). Both parties may benefit from the innovation: for example, when innovation results in a better service or product for the focal organization and in more efficient delivery of the transaction for the partner. It is important to note that innovations conducted by the external partner are employed as part of the daily activities and are not a performance objective per se: contracted activities (e.g., delivery, quality) may or may not be accompanied by innovation. This as opposed to innovation contracts (Beneito, 2006; Gilson, Sabel, & Scott, 2009), where innovation is the sole performance outcome.

However, the use of PBCs and their effects on relationship outcomes have been relatively under-researched. The literature that is available is primarily of a descriptive (case-based) nature (Hypko et al., 2010; Martin, 2002). More specifically, though several authors have acknowledged that PBCs allow room for the partner to engage in innovation (Kim et al., 2007; Martin, 2002), none of the research empirically studies how this effect occurs. Thus, on the one hand, incomplete contracts are viewed as governance mechanisms that leave room for opportunistic behavior. On the other hand, incomplete contracts, or more specifically PBCs, are said to foster innovation. Nevertheless, empirical evidence on whether and how PBCs foster innovation is lacking. This
dissertation contributes to this debate by focusing on PBCs as a specific type of incomplete contract and develops and empirically tests a conceptual model that explains how the characteristics of PBCs affect innovation. The main research question is therefore formulated as:

**Main Research Question 1: To what extent do PBCs affect innovation in IORs?**

The main research question raises three additional sub-research questions. First, existing research on PBCs is highly context specific and in general covers a wide variety of sectors. As a result, a common definition and identification of the characteristics of PBCs across sectors does not exist yet (Martin, 2002). Given that we want to focus on the effects of incomplete contracts, such as PBCs, on innovation, it is important to define and identify the most important characteristics of PBCs. Second, given that existing research has not focused on the effects of incomplete contracts on innovation, it is necessary to build a preliminary conceptual model that shows how existing governance, management and innovation literature and theories could explain the relationship between incomplete contracts, such as PBCs, and innovation. By using these general literature fields and theories, we might gain more insight into the relationship between PBCs and innovation before empirically investigating such contracts. The first and second sub-research questions are therefore formulated as:

**Research Question 1A: What are the main characteristics of PBCs?**

**Research Question 1B: How can the relationship between PBCs and innovation in IORs theoretically be explained?**

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Note that this dissertation links the characteristics of PBCs (which are present in different contract types in different degrees) to innovation.
Additionally, incomplete contracts, such as PBCs, are not always successful. Despite the importance and increasing use of PBCs in practice, they do not always result in the desired performance and innovation. More generally, while some authors claim that contracts positively affect innovation (Johnson & Medcof, 2007; Wang et al., 2011), others have found this effect to be absent (Gopal & Koka, 2010). It might be the case that there are mechanisms and conditions present in certain IORs that may or may not be beneficial for innovation when using incomplete contracts, such as PBCs. Hence, the conceptual model developed based on the above research questions needs refinement, there might be other variables (e.g., moderators and mediators) in play that cannot be identified by using existing literature and theories but can be observed in real life settings. The conflicting observations in theory and the sometimes unsuccessful use of PBCs in practice result in the following sub-research question:

**Research Question 1C:** How can the relationship between PBCs and innovation in IORs empirically be explained?

Note however, in the above research questions it is deliberately decided to solely focus on a specific type of contract to fully understand its effects on outcomes so that it can subsequently be placed in a broader context by including informal governance as well. IORs which focus merely on contractual governance face a large number of drawbacks as many recent studies find that the interplay between formal and relational governance (such as trust) maintains the cooperative performance of the IOR (Huang et al., 2014). Relational governance could also affect innovation; parties that interact closely share know-how, which can positively affect innovation (Im & Rai, 2008). Hence, to understand how to foster innovation in IORs, the role of relational governance, in addition to formal governance (i.e., contracts in general), should also be emphasized.
Nevertheless, despite the large amount of research on relational governance methods, to date there is little consensus on the combined effect of trust and contracts on relational outcomes: while some researchers view contracts and trust as substitutes (i.e., trust or contracts produce the desired outcome) (Dyer & Singh, 1998; Gulati, Lawrence, & Puranam, 2005) others consider contracts and trust to be complements (i.e., trust and contracts jointly produce the desired outcome) (Poppo & Zenger, 2002). Various authors have provided evidence on the complementary roles of contracts and trust and opt for using both governance mechanisms (Fryxell et al., 2002; Luo, 2002; Poppo & Zenger, 2002) since effective IOR governance structures draw on a combination of contractual and relational aspects (Mahapatra, Narasimhan, & Barbieri, 2010), as to take advantage of their differential impact (Lindqvist, 1996). This suggests that both may be necessary for achieving desired outcomes. To date however, contracts and trust have not been viewed in terms of necessity. Nevertheless, assertions reflecting necessity are commonplace in management literature; various authors do hint at the critical nature of contracts and trust. Malhotra and Lumineau (2011) for example argue that trust is critical for inter-firm collaboration and value creation. Lazzarini et al. (2004) state that under low probability of continued exchange, contracts become critical for cooperation. However, such claims have rarely been appropriately tested; researchers test these claims with traditional variance-based analysis techniques (e.g., regression analyses). Investigating these claims of the necessity of these two governance mechanisms with the Necessary Condition Analysis (i.e., NCA) is a valuable addition to the literature on contracts and trust viewed as complements.

The final research question therefore aims at identifying whether both contracts and trust are necessary but not sufficient conditions for innovation. In addition, for different degrees of innovation, the combination (levels) of both governance mechanisms might be different. It is, therefore, important to understand to what extent both governance mechanisms are necessary for
innovation. Necessary conditions are those factors that *enable* innovation rather than those that *predict* innovation; absence of these conditions guarantees failure (i.e., not achieving innovation) that cannot be compensated for by other factors. The final research question of this dissertation is formulated as:

**Research Question 2:** Which combinations of contracts and trust are necessary for achieving innovation in IORs?

### 1.4. Research Strategies and the Four Research Studies

The above research questions are investigated in four studies. Research questions 1A, B, and C concern a relatively new research field in the area of formal governance and innovation in IORs and, thus, require research methodologies that support theory building. First, in study 1, a literature review is used to identify the characteristics of PBCs and develop the conceptual model to identify the relationship between the characteristics of PBCs and innovation (theory building). In addition, in order to understand why certain IORs are more successful in terms of innovation and others are not when using PBCs, an indepth qualitative study is carried out in study 2 to refine the model which was developed in study 1 (theory elaboration). Though case studies are commonly known for theory development studies, study 2 uses case studies for elaborating on theory (Ketovi & Choi, 2014). The aim is not to test the logic developed in study 1, rather we elaborate it by introducing new concepts (Ketovi & Choi, 2014). A general theoretical logic is already applied (which is developed in study 1) and we investigate our model and the empirical context simultaneously. Hence, we do not anticipate empirical findings by a priori formulation and testing of hypotheses, rather we remain open for unanticipated findings and the possibility that the developed model requires reformulation (Ketovi & Choi, 2014). Then, a quantitative study is designed and carried out to test the model
(theory testing) in study 3. Finally, in study 4, a theory testing methodology is used to uncover which combinations of contract and trust are necessary for achieving innovation.

The research aims and research methodologies of the four studies are briefly outlined in the below sub-sections. In addition, table 1.2 shows an outline of the four studies in this dissertation.

1.4.1. **Study 1: A Conceptual Framework of the Relationship between the characteristics of (in)complete contracts, such as PBCs, and Innovation**

The first study aims to answer research question 1A and 1B. Specifically, the study’s objective is to identify the key characteristics of PBCs and develop a conceptual model that identifies how existing theories can explain the relationship between the characteristics of PBCs, and innovation.

To accomplish this objective, study 1 makes use of an extensive literature review, also outside of the contracting and PBC literature. Specific journals are not targeted, rather, the study focuses on a variety of different literature fields to develop a model that explains how PBCs affect innovation. The literature search reveals conceptual and empirical papers in leading journals that deal with IORs, contracts and innovation. A conceptual model is then developed that hypothesizes how the characteristics of PBCs (which may be present in different degrees within PBCs) affect innovation by using TCE and AT.

1.4.2. **Study 2: Refining the Conceptual Model**

The second study aims to answer research question 1C. Specifically, this study tries to empirically refine the conceptual model. The theoretical lenses used in this study are TCE and AT.

To achieve this objective, study 2 adopts a case research strategy. To identify the domain from which to select the cases, before the actual case
studies, five exploratory interviews were conducted with professionals who use PBCs to source different kinds of services (i.e., facilities, IT, marketing, maintenance, and human resources). Study 2 investigates two cases of performance-based IT-service contracts at one contracting organization; these contracts differ with regard to innovation performance. The analyses are based on extensive interviews with representatives of both sides of the IOR and on analyses of the actual content of the contracts and other relevant formal documents. The possibility to study the actual content of the contracts in addition to other data sources is relatively unique in IOR research (Faems et al., 2008), as organizations are usually not willing to share this kind of information, and it greatly enhances the quality of the analyses of an otherwise limited number of cases. By conducting case-based research, the study can find additional variables that could explain how the characteristics of PBCs affect innovation, which could not be identified based on existing literature and theories. Hence, this study refines the conceptual model developed in study 1.

1.4.3. Study 3: An Empirical Test of the Effects of the characteristics of Incomplete Contracts, such as PBCs, on Innovation

The aim of study three is to answer the main research question by empirically testing the conceptual model developed in the previous studies. This study uses TCE and AT to develop the theoretical background. This study makes a distinction between incremental and radical innovation as, even though various authors have asserted that organizational antecedents that are favorable for one type of innovation may be unfavorable for the other (e.g., de Brentani, 2001; Koberg et al., 2003), empirical studies provide mixed results (Jansen, Van Den Bosch, & Volberda, 2006). Study 3 is thus an additional contribution to the previous studies by first, adding more detail to the developed conceptual model by distinguishing between incremental and radical innovation and second, by empirically testing the model.
Data for this study was collected from 106 buying and selling organizations active in the Dutch maintenance industry, and analyzed using structural equation modelling. Before the actual data collection, a pilot test with 74 buying organizations in different industries from the members of the Dutch Association for Purchasing Professionals (NEVI) was conducted to evaluate feasibility, time, and adverse events to improve study design prior to the actual data collection.

1.4.4. Study 4: Combinations of Contracts and Trust in Achieving Innovation

The objective of study four is to answer research question 2 by determining which combinations of contracts and trust are necessary for innovation. In line with existing research, this study makes a distinction between goodwill- and competence trust (Das & Teng, 1998; Malhotra & Lumineau, 2011). In this study, contracts in general are studied rather than focusing on a specific type of contract. The reason is that by taking a broader perspective, the necessary conditions related to formal and relational governance in general could be identified to make the results applicable to all contract types. Given that this study incorporates contracts and trust, it makes use of TCE and the Social Exchange Theory.

To identify which combinations of contracts and trust are necessary for innovation, data on 48 IORs from the Dutch maintenance industry is used. A necessary condition is a condition that must be present to be able to have a certain outcome (Dul et al., 2010). The presence of the condition does not guarantee the outcome (the condition is necessary but not sufficient), but the absence of the condition does guarantee failure (i.e., not achieving the outcome). To identify these critical factors, traditional variance-based analysis methods (such as regression analyses) are not suitable to answer the final research question. Rather, the appropriate analysis for investigating such critical factors
is the necessary condition approach (Dul et al., 2010). Using this analysis method is a contribution in the governance literature as this study is one of the first to use the NCA approach.

Note that this study uses a subset of the data used in study 3. It was decided not to take the full set of the data - which contains responses from a focal firm as well as a partner’s firm - because the NCA method cannot control for confounding factors (i.e., control variables). Hence, it was important to create a homogeneous dataset, which resulted in using 48 responses of the focal firm. In addition to this, given that incremental innovation occurs more often in the maintenance industry, we have decided to show the results of this type of innovation only (nevertheless, the results of radical innovation are shown in an appendix) due to the complexity of introducing a new analysis method (i.e., NCA). This study makes an additional contribution to the previous three studies by looking at the combined role of contracts and trust.

1.5. Overview of this Dissertation

Four studies are conducted in this dissertation to identify how a specific type of incomplete contract, the PBC, affects innovation and investigate the combined role of contracts and trust in achieving innovation. The first study (chapter 2) outlines the conceptual model that shows how the characteristics of PBCs affect innovation by means of an extensive literature review. Study two (chapter 3) tries to empirically refine this model by means of two case studies. Furthermore, study three (chapter 4) tests the developed model by means of a survey conducted in the Dutch maintenance industry. Finally, the fourth study (chapter 5) aims to understand which combinations of contracts and trust are critical for achieving innovation by using the NCA methodology. The final chapter (chapter 6) of this dissertation presents a general discussion about this research, including the main conclusions, theoretical and managerial implications, limitations, and it
provides interesting directions for future research. Note however, the core chapters of this dissertation (i.e., chapters 2, 3, 4, and 5) are presented as separate research papers. These chapters can thus be read independently of each other. However, given the setup of this dissertation related to research questions 1A, B, and C where first, we develop the conceptual model, then refine and test the model, there is some overlap between the chapters. This overlap is especially present in the theoretical sections. We are aware of this but we weigh the importance of presenting the chapters as separate research papers over the disadvantage over some overlap between the chapters.
Table 1.2: Outline of the Four Studies in this Dissertation

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Chapter 2 (Study 1)</th>
<th>Chapter 3 (Study 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Innovation</td>
<td>• Innovation</td>
</tr>
<tr>
<td></td>
<td>• Performance-based contract</td>
<td>• Performance-based contract</td>
</tr>
<tr>
<td></td>
<td>• Term specificity</td>
<td>• Term specificity</td>
</tr>
<tr>
<td></td>
<td>• Pay-for-performance</td>
<td>• Pay-for-performance</td>
</tr>
<tr>
<td></td>
<td>• Risk-averseness</td>
<td>• Risk-averseness</td>
</tr>
<tr>
<td></td>
<td>• Autonomy</td>
<td>• Autonomy</td>
</tr>
<tr>
<td>Research question(s) / aim(s)</td>
<td>• Research question 1A, because this study identifies the key characteristics of PBCs which can then be linked to innovation</td>
<td>• Research question 1C, because this study tries to empirically refine the model developed in study 1 to indentify why some PBCs are more succesful in terms of achieving innovation and others are not</td>
</tr>
<tr>
<td></td>
<td>• Research question 1B, because this study examines how the relationship between the characteristics of PBCs and innovation can be theoretically explained</td>
<td></td>
</tr>
<tr>
<td>Theoretical background</td>
<td>• Transaction cost economics (TCE) &amp; Agency theory (AT)</td>
<td>• TCE &amp; AT</td>
</tr>
<tr>
<td></td>
<td>• TCE used for explaining the link between term specificity and innovation. AT used for explaining the link between pay-for-performance, risk-averseness, and innovation</td>
<td>• TCE used for explaining the link between term specificity and innovation. AT used for explaining the link between pay-for-performance, risk-averseness, and innovation</td>
</tr>
<tr>
<td>Research methodology / Sample</td>
<td>• Literature study</td>
<td>• Case study: 2 cases in the IT-industry</td>
</tr>
<tr>
<td>Data / respondents</td>
<td>• Scientific papers</td>
<td>• Interviews, contractual and archival data. Data is collected from both sides of the IOR</td>
</tr>
<tr>
<td>Link between the chapters</td>
<td>• Develop a theoretical model of the relationship between the characteristics PBCs and innovation</td>
<td>• Extend theoretical model developed in the previous study by identifying additional variables</td>
</tr>
</tbody>
</table>
### Table 1.2: Outline of the Four Studies in this Dissertation

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
</table>
|              | • Incremental innovation
|              | • Radical innovation
|              | • Performance-based contract
|              | • Term specificity
|              | • Pay-for-performance
|              | • Risk-averseness
|              | • (Incremental) innovation
|              | • Contracts
|              | • Contractual detail
|              | • Goodwill trust
|              | • Competence Trust
|              | • Necessary condition analysis

<table>
<thead>
<tr>
<th>Research question(s) / aim(s)</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The main research question, because this study empirically tests the relationship between the characteristics of PBCs and incremental and radical innovation</td>
<td>• Research question 2, because this study takes a broader perspective and identifies the combinations of contracts in general (not just PBCs) and trust which are necessary for different degrees of innovation</td>
</tr>
</tbody>
</table>

Hence, rather than testing how contracts and trust, on average, lead to higher degrees of innovation, this study identifies the combinations of these two governance modes for certain degrees of innovation. These combinations do not guarantee the outcome, but their absence guarantees failure. The hypotheses are tested by using the necessary condition analysis.

<table>
<thead>
<tr>
<th>Theoretical background</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• TCE &amp; AT</td>
<td>• TCE &amp; Social exchange theory (SET)</td>
</tr>
<tr>
<td></td>
<td>• TCE used for explaining the link between term specificity and innovation. AT used for explaining the link between pay-for-performance, risk-averseness, and innovation</td>
<td>• TCE used for explaining the link between contractual detail and innovation. SET used for explaining the link between (goodwill/competence) trust and innovation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research methodology / Sample</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Survey: 106 respondents in the Dutch maintenance industry</td>
<td>• Survey: 48 respondents in the Dutch maintenance industry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data / respondents</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Perceptual and contractual survey data. Data collected from a focal organization (buyer) and an external partner (supplier)</td>
<td>• Perceptual and contractual survey data. Data collected from the focal organization (buyer). Data in this study is a subset of the data used in study 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Link between the chapters</th>
<th>Chapter 4 (Study 3)</th>
<th>Chapter 5 (Study 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Extend and test theoretical model developed in the previous studies</td>
<td>• Take a broader perspective by also incorporating the relational aspects of an IOR through researching whether and which combinations of contracts in general and trust are necessary but not sufficient conditions for innovation</td>
</tr>
</tbody>
</table>
CHAPTER 2

How (in)Complete Contracts Foster Innovation in Inter-Organizational Relationships

Recent contributions suggest that performance-based contracts (PBC) foster innovation. However, it is unknown how this effect occurs. This study’s objective is to identify the key characteristics of PBCs and develop a conceptual model that identifies how transaction cost economics and agency theory can explain the relationship between these key characteristics and innovation.

This study makes use of an extensive literature review, also outside of the contracting and PBC literature. The literature review reveals conceptual and empirical papers in leading journals that deal with IORs, contracts and innovation. Given the introductory and theoretical nature of this chapter, this study also discusses what determines contractual completeness as background information before identifying the effects of the characteristics of (performance-based) contracts on innovation. Given the large amount of research on the determinants of contractual completeness, the remaining chapters of this dissertation do not (theoretically and empirically) focus on this topic. Rather, the focus on the effects of contracts on innovation.

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8 This research was conducted in collaboration with Van der Valk, W. (2nd author), Van Weele, A. (3rd author), and Duysters, G (4th author). An earlier version of this chapter was presented at the 2012 AoM (Boston, USA), ICIM (Eindhoven, Netherlands) and IPSERA (Naples, Italy) conferences. An adapted version of this chapter is under review for publication in a general management journal.


10 The principal researcher of this dissertation (who is the first author of this chapter) was responsible for the research question, literature search, theory development and the final version of this manuscript. During revision moments of this study, the co-authors rewrote and provided detailed feedback for the improvement of the manuscript.
2.1 Introduction

Innovation (both radical and incremental) in products, processes, and services is critical for firms to gain and sustain competitive advantage (Brown & Eisenhardt, 1995; Hecker & Ganter, 2013; Hollen et al., 2013; Keupp, Palmié, & Gassmann, 2012). Since firms rely on externally developed as well as internal knowledge to improve innovation and create value (Chesbrough, 2006), external partners have become a critical source of innovative solutions, ideas, and technologies (Echtelt, Wynstra, Weele, & Duysters, 2008; Roy et al., 2004). This applies not only to manufactured products but also to services. The increased outsourcing of processes and functions such as IT development, call-centre functions, and even product design (Bhalla, Sodhi, & Son, 2008; Fifarek, Veloso, & Davidson, 2008; Miozzo & Grimshaw, 2005; Vandaele et al., 2007) makes external partners critical to organizations’ innovation activities.

Inter-organizational relationships (IORs) are therefore an increasingly important way to engage in innovation (Phelps, 2010). Specifically, IORs are generally found to enhance (Faems et al., 2005; Goes & Park, 1997; Teece et al., 1997) or even drive (Hamel, 1991; Leonard-Barton, 1998) innovation. However, besides these positive effects, inter-firm collaboration may also have negative effects on innovation. For example, firms may be exploited by an opportunistic partner (Malhotra & Lumineau, 2011; Walker & Weber, 1984; Williamson, 1985), or the collaboration may suffer from coordination failures that impede the efforts of even well-intentioned parties (Gulati et al., 2005; Malhotra & Lumineau, 2011). These hazards might inhibit innovation if they are not governed properly (Mellewigt et al., 2007; Ryall & Sampson, 2003).

To mitigate these hazards, organizations use governance mechanisms such as contracts (Lumineau & Malhotra, 2011; Parmigiani & Mitchell, 2010; Ring & van de Ven, 1992). Transaction cost economics (TCE) and agency theory (AT) indicate that organizations should design contracts that take into account certain transaction characteristics such as frequency, asset specificity,
environmental and behavioral uncertainty, and task complexity (Anderson & Dekker, 2005; Chen & Bharadwaj, 2009; Williamson, 1979). Such transaction characteristics may increase risk associated with contracting; therefore TCE asserts that to minimize hazards and maximize transaction gains, contracts should be as complete as possible (Williamson, 1985). Nevertheless, TCE suggests that contracts are inevitably incomplete since organizations are unable to foresee all future events and consider both the ex-ante and ex-post transaction costs (Mayer & Argyres, 2004).

The problem with incomplete contracts, compared to more detailed contracts is that they do not sufficiently address the transaction characteristics that may result in opportunistic behavior (Goldberg, 1976, 1985; Williamson, 1985). Nevertheless, incomplete contracts offer two important benefits over more detailed contracts. First, they are characterized by flexibility in the sense that they allow for contingency adaptability (Bernheim & Whinston, 1998; Luo, 2002), i.e., the changes required to allow the focal firm’s partner\(^{11}\) to deal with unforeseen circumstances. Second, and more importantly, incomplete contracts allow more freedom in the contract execution phase for the partner to decide how to deliver the transaction because they are more open (Bernheim & Whinston, 1998; Luo, 2002). In other words, they are less prescribing in nature. Since the prescribing character of detailed contracts has been argued to inhibit the partner to engage in innovation (Hart, 1989; Wang et al., 2011), it is the freedom in incomplete contracts that is expected to allow room for the partner to engage in innovation and that is the main focus of this chapter.

Specifically, researchers have suggested that performance-based contracts (PBCs), a type of incomplete contract predominantly used in the context of partnering with an organization that delivers services, positively

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\(^{11}\) An IOR can take many forms, such as joint ventures, joint production, contracted R&D, and a long term buyer-seller relationship. In this chapter, we address our research question from an intra-IOR perspective. Thus: ‘focal firm’ refers to an organization within the IOR (e.g., a buyer), and ‘partner’ refers to the partner of that focal firm (e.g., a seller). Finally, ‘parties’ refers to the two organizations that are part of the IOR (e.g., the buyer and the seller that form the IOR).
affect innovation (Gates et al., 2004; Kim et al., 2007; Martin, 2002; Ng et al., 2009; Ng & Nudurupati, 2010). PBCs\(^\text{12}\) are characterized by low term specificity and the extent to which the partner’s rewards are tied to the performance it has to deliver. Term specificity is the extent to which contractual clauses related to obligations and behaviors are specified in detail. Low term specificity refers to the fact that PBCs underline the outcome of the transaction rather than prescribing *how* to deliver it or which resources to use (i.e., freedom). Thus, an important element in PBCs is the clear separation between the focal firm’s expectations (i.e., the performance goal) and the partner’s implementation (i.e., how it is achieved) (Kim et al., 2007). By allowing the partner to determine how to best accomplish the work, PBCs strive to increase the innovative behavior of the partner in an IOR (Kim et al., 2007; Martin, 2002; Ng et al., 2009). For this reason, PBCs are increasingly applied in practice, in both the public and private sectors. However, the use of PBCs and their effects on relationship outcomes have been relatively under-researched (Hypko et al., 2010; Martin, 2002). More specifically, though several authors have acknowledged the positive effects of PBCs on innovation, none of the research specifically studies how this effect occurs.

We therefore focus on PBCs as a specific type of incomplete contract and develop a conceptual model that identifies the key characteristics of PBCs and explains *how the characteristics PBCs affect innovation*. By linking these concepts, we hope to take a first step toward an increased understanding of how incomplete contracts affect positive relationship outcome (i.e., innovation). The extant literature focuses primarily on the negative effects of incomplete contracts on relationship outcome (Williamson, 1985). Moreover, as noted in the review paper of Schepker and colleagues (2014), there is a scarcity of

\(^{12}\) Note that we focus here on (performance-based) contracts in general, where contracted activities or performance (e.g., delivery, quality) may or may not be accompanied by innovations. This as opposed to innovation contracts (Beneito, 2006; Gilson, Sabel, & Scott, 2009), where innovation is the sole performance outcome.
research that focuses on positive performance implications of contracts. Thus, the question of how (incomplete) contracts affect innovation is insufficiently answered.

In line with existing research, our theoretical model builds on the agency and transaction cost theories\textsuperscript{13} in relation to contractual governance. We use TCE to argue how term specificity affects innovation, and AT to propose how the partner’s rewards that are linked to its performance affect innovation. The value and limitations of these established theoretical perspectives are well understood (Johnson & Medcof, 2007) and they been extensively used in research into the design of contracts and their effects on performance (Argyres, Bercovitz, & Mayer, 2007; Argyres & Mayer, 2007; Luo, 2002; Reuer & Ariño, 2007; Saussier, 2000; Williamson, 1985). However, to date there have been no attempts made to consider these two perspectives collectively rather than separately to understand the effects of (incomplete) contracts in general, and PBCs in particular, on innovation. This is counterintuitive as both theories provide different solutions for fostering partner innovation in IORs.

The remainder of this chapter is organized as follows. We first provide an overview of how contractual completeness is dependent on certain transaction characteristics described by the TCE and AT. We then review the literature on (incomplete) contracting and performance-based contracting to enhance our understanding of contracts in relation to innovation as a specific type of relationship outcome. We then develop propositions on how the characteristics of PBCs affect innovation. The chapter concludes with implications and avenues for future research.

\textsuperscript{13} We are aware of the critiques of these theories (e.g., the simplistic assumptions about the economic actors). However, they do cover, in combination, the key characteristics of incomplete contracts such as PBCs, as we later will explain. Furthermore, the combination of these theories provides a unique understanding of how to foster innovation in IORs by means of PBCs.
2.2. Transaction Cost Economics and Agency Theory for Determining Contractual Completeness

2.2.1. Transaction cost economics

TCE has emerged as an important paradigm for understanding how organizations design their inter-organizational governance arrangements (Mayer & Argyres, 2004; Poppo & Zenger, 2002). The literature takes its starting point with Coase’s (1937) statement that the boundary of a firm is defined by cost-minimizing choices, specifically in situations where firms choose to make or buy products and services (as in Anderson & Dekker, 2005). Williamson (1979) continued to state that incomplete information and information asymmetry barricades organizations to write complete contracts; these information problems are seen as a source of transaction costs that motivate organizations to vertically integrate rather than buy the product or service. More recently, however, TCE has been used in the emergence of hybrid organizational forms (e.g., alliances, preferred supplier arrangements, and joint ventures) that combine the advantages of buying from the market with the control and oversight of vertical integration (Anderson & Dekker, 2005; Williamson, 1985). Thus, if vertical integration is neither feasible nor economical and if market transactions cannot meet demands for customization, coordination, and collaboration, a middle ground of hybrid organizational forms is opted for (Anderson & Dekker, 2005).

In order to ensure successful IORs, organizations make use of formal controls, such as contracts, to govern the IOR (Das & Teng, 2001). According to TCE, the degree of contractual completeness is dependent on three important transaction characteristics, namely: 1) transaction specific investments, 2) frequency of the transaction, and 3) environmental uncertainty (Anderson & Dekker, 2005; Chen & Bharadwaj, 2009; Williamson, 1979). These transaction characteristics potentially trigger increased transaction costs, which undermines
the efficiency of the IOR and determines how complete the contract is (Zhou & Poppo, 2010).

Transaction specific investments are assets that are tailored to a particular IOR and cannot be easily used outside this particular IOR (Geyskens, Steenkamp, & Kumar, 2006). It is the exposure of the parties to ex-post opportunistic holdup caused by the specific investment in these assets (Anderson & Dekker, 2005). Examples are investing in very specific machines, customized technology or training of personnel (Chen & Bharadwaj, 2009; Stump & Heide, 1995). In order to curb the opportunism caused by holdup, parties try to design contracts as detailed as possible by e.g., describing tasks, implementing close monitoring processes, intellectual property provisions, and dispute resolutions (Brousseau & Coeurderoy, 2005).

Frequency relates to the intensity of trade between the two partners. In TCE, frequency is intended to capture the degree to which future transaction opportunities serve as a bond against opportunities in the present period (Anderson & Dekker, 2005). Though prior research states that a certain frequency will provide some degree of mutual trust and therefore reduce the need to draft complete contracts (Chen & Bharadwaj, 2009; Dyer & Singh, 1998; Gulati, 1995; Ring & Van de Ven, 1994), recent theoretical and empirical work into contract design states that parties become familiar with each other’s business processes, decision-making styles and corporate cultures, and thus improve the ability to draft more detailed contracts (Chen & Bharadwaj, 2009; Mayer & Argyres, 2004; Poppo & Zenger, 2002). Thus, a higher frequency of trade leads to less transaction costs as a result of an increased ability to describe tasks, associated monitoring requirements, and dispute resolutions, thereby increasing the ability to write detailed contracts.

Finally, environmental uncertainty occurs when parties involved in a transaction are unable to fully predict and understand the environment in which the transaction takes place (Heide, 1994). It refers to unanticipated and
unpredictable changes in circumstances surrounding an exchange (Zhou & Poppo, 2010). Environmental uncertainty will increase the use of explicit clauses to facilitate adjustments as events occur (i.e., contingency adaptability clauses) (Masten, 1993). In addition, in case of environmental uncertainty, organizations explicitly formalize roles and processes (Verbeke & Greidanus, 2009; Zhou & Poppo, 2010). Thus, the parties want to seek control and design more complete contracts if environmental uncertainty is more strongly present. Similarly, Barthelemey and Quelin (2006) find that when there is more environmental uncertainty, the more detailed the contract becomes.

2.2.1. Agency Theory
Agency theory concerns the agency relationship, in which one party (the principal) delegates work to another party (the agent), which performs that work (Eisenhardt, 1989; Jensen & Mecklin, 1976). AT is firstly concerned with resolving the agency problem arising from: a) goal conflict between the agent and the principal, and: b) the difficulty of and cost associated with verifying agent behavior due to e.g., information asymmetry. Secondly, AT tries to resolve the problem of risk sharing that arises when the principal and the agent have differing risk attitudes (Eisenhardt, 1989). AT determines the most efficient contract (i.e. behavior- or outcome based contract) with reference to several exchange characteristics that may create ex-post problems such as opportunism (Eisenhardt, 1989) and hence influence the degree of contractual completeness. These exchange characteristics are: 1) measurement problems; 2) task programmability; and: 3) outcome uncertainty (Chen & Bharadwaj, 2009; Eisenhardt, 1989; Jensen & Meckling, 1976; Mooi & Ghosh, 2010).

Measurement problems refer to difficulties associated with measuring the outcomes of the transaction (Anderson, 1985; Eisenhardt, 1985). When performance cannot be easily verified, it becomes more difficult to assess whether the agent adheres to the contract (Stump & Heide, 1996). This increases
the hazard the principal is faced with as the agent might engage in inappropriate and opportunistic behavior. In addition, measurement problems will increase the renegotiation costs that are incurred when further detailing the contract, which adds to transaction costs (Mooi & Ghosh, 2010). In such cases, they opt for behavior-based contract that are more complete than outcome based contracts, such as PBCs.

Task programmability concerns the complexity of the transaction. Complexity is common when both parties contribute complex components or services that interact in unpredictable ways to produce the desired final product or service (Anderson & Dekker, 2005). When the task to be conducted by the agent is easy to program, his behavior can be specified in advance. Task programmability lowers the hazards the principal is faced with, as it is easier to write detailed contracts that prescribes the behavior the agent should conduct. Hence, the easier it is to program the task, the more likely organizations will use behavior-based contracts.

Finally, outcome uncertainty occurs when the outcome of the transaction is highly uncertain and is dependent on factors outside of the control of the parties within the IOR. Hence, it is the inability to pre-plan for the outcome (Eisenhardt, 1989). To mitigate the uncertainty of realizing outcomes, principals will seek to draft more explicit contracts regarding e.g., roles and responsibilities (Eisenhardt, 1989; Zhou & Poppo, 2010). In such cases, organizations will opt for behavior-based contracts.

Overall, in line with existing research, transaction hazards depicted by TCE or AT are associated with the degree of contractual completeness. As noticed in this section, there has been a large amount of research conducted on what determines contractual completeness. However, given that little is known on the performance effects of contracts (Schepker et al., 2014), this dissertation does not focus on the antecedents of contractual completeness and we, therefore, do not take the transaction characteristics into consideration in our
(theoretical and empirical) models. Hence, we start from the point that the contract is already determined and present in the IOR and we investigate how (performance-based) contracts affect innovation, as there is a lack of research on this topic. In the next section, we will first discuss the role of contracts in IORs.

2.3. Contracts in Inter-Organizational Relationships

More complete contracts provide safeguards against ex-post performance problems by discouraging the partner from pursuing its individual objectives at the expense of mutual benefits (Argyres et al., 2007; Argyres & Mayer, 2007; Luo, 2002; Reuer & Ariño, 2007; Saussier, 2000; Williamson, 1985). According to TCE, to maximize relationship gains, contracts should be as complete as possible (Argyres et al., 2007; Argyres & Mayer, 2007; Luo, 2002; Reuer & Ariño, 2007; Saussier, 2000; Williamson, 1985) and contain clauses that address all sources of opportunistic behavior. Complete contracts are contingent on all events that are relevant to the fulfillment of the contract, and they represent what organizations would specify in a world in which all future events could be foreseen (Saussier, 2000).

In reality however, contracts are frequently incomplete (Al-Najjar, 1995; Hart & Moore, 1999; Kloyer & Scholderer, 2012; Mayer & Argyres, 2004). Such contracts do not specify observable obligations and actions for the parties (Bernheim & Whinston, 1998). The degree to which these obligations and actions are specified is known as “term specificity” (Luo, 2002). Contracts are inevitable incomplete for two reasons. First, incomplete contracts relax the extreme-rationality assumption that holds for complete contracts. The parties are subject to bounded rationality; that is, they are not able to specify all the terms and clauses (i.e., obligations and actions) (Aghion & Holden, 2011; Tirole, 1999). Hence, the parties may not identify some contingencies or may not
acknowledge the need to specify certain dimensions of the contractual performance (Bernheim & Whinston, 1998). Furthermore, some actions are observable by only one party or cannot be written in a way that can be legally enforced by a third party (i.e., a court) (Lyons, 1996). Second, organizations balance the ex-ante costs of designing complete contracts with the ex-post costs of less exhaustive arrangements (Crocker & Masten, 1991). Whereas ex-ante costs may include the time, negotiation, and management costs involved in preparing a detailed contract, ex-post costs include opportunistic behavior and renegotiation costs. However, even if the ex-ante costs are low, contracts may still be incomplete. This is often intentional (Bernheim & Whinston, 1998): these contracts contain gaps that could have easily been covered, but have been left open for purposes of allowing freedom and flexibility during the day-to-day operations of the service delivery. Thus, incomplete contracts do not stipulate all obligations and actions and are therefore characterized by freedom and flexibility (Al-Najjar, 1995; Argyres et al., 2007; Bernheim & Whinston, 1998). This freedom can favor innovation because it allows the partner to make its own decisions about the delivery of the transaction.

The PBC is such an agreement that has intentionally been left incomplete. The contract focuses on the performance rather than the inputs and processes (i.e., an outcome based contract), so PBCs have lower term specificity than for example behavior-based contracts, which prescribe how the partner should deliver the transaction (the process) and which resources to use (the inputs). Further, in PBCs, the partner is, to a large extent, rewarded based on their performance. The behavior-based contract in contrast reimburses the partner for the processes carried out and the resources used. Thus, PBCs have two key characteristics, low term specificity and the partner’s rewards being linked to performance (i.e. pay-for-performance) (Else et al., 1992; Hypko et al., 2010; Martin, 2002; Ng & Nudurupati, 2010). Even though, compared to other contract types, PBCs are characterized by lower term specificity and reward
schemers linked to performance, within PBCs one can observe different degrees of these characteristics. For example, one contract might state that the partner can choose any IT technology, provided it is from an A-brand manufacturer, whereas another might omit the A-brand condition. The latter has lower term specificity than the former.

These two characteristics are also found in current studies on PBCs, which cover a variety of sectors. For example, research in logistics, supply chain management, and service management (e.g., Doerr, Lewis, & Eaton, 2005; Ng et al., 2009; Ng & Nudurupati, 2010) defines a PBC as a contract that “describes and communicates measurable outcomes rather than direct performance processes” (Department of Defense, 2002, p.1). Studies in healthcare underline the importance of an additional, above-the-baseline (i.e., fixed pay) compensation based on measures of quality of care and treatment outcome (Lindrvist, 1996; Lu, Ma, & Yuan, 2003; Shen, 2003).

### 2.4. The Role of Performance-Based Contracts in Innovation

Our review of the literature did not reveal any papers that focus on how PBCs affect innovation. Kim et al. (2007) state that PBCs promote new and improved ways of delivering the transaction, but they do not consider the exact underlying mechanisms. We therefore turned to the general contracting literature and found two papers that relate contractual detail to innovation (Johnson & Medcof, 2007; Wang et al., 2011). We build on these two contributions to consider how the first characteristic of a PBC (low term specificity) affects innovation. Furthermore, Johnson and Medcof (2007) discuss the effects of rewards on innovation, albeit in an *intra-firm* setting where the principal is the firm and the agent is a separate division of the organization. Moreover, the management compensation literature contains a significant number of papers that use AT to study the effects of rewards on relationship outcome, such as performance and
innovation (Bloom & Milkovich, 1998; Makri, Lane, & Gomez-Mejia, 2006; Roth & O’Donnell, 1996; Stroh, Brett, Baumann, & Reilly, 1996). We draw on this literature to outline the effect of the second characteristic of a PBC (i.e., partner pay) on innovation in an IOR context. In doing so, we take great care to include only those papers for which the reasoning can naturally be applied to inter-firm transactions.

To define innovation, we made use of our two key articles that relate contracts to innovation. Wang et al. (2011) argue that innovation is a structured, knowledge-intensive activity that is embedded in networks that span organizational boundaries. Moreover, these authors emphasize the partner to be a source of innovative ideas and technologies. Johnson and Medcof (2007) define innovation as discrete, proactive undertakings by agents that open new ways for organizations to use or expand their resources. In line with these authors, we define innovation as partner-initiated, proactive undertakings that result in new or improved ways of delivering transactions (Johnson & Medcof, 2007). Note that this not only includes radical innovation such as new products/services, but also incremental innovation such as process improvement that may e.g., result in a better quality. The key premise of this definition of innovation is that the organizations tap into the partner’s entrepreneurial ideas (Shimizu, 2012). Both parties benefit from innovation, for example a better service or product for the contracting organization or a more efficient delivery of the transaction for the contractor. In the following sections we will outline our reasoning about the effects of the two characteristics of PBCs on innovation.

2.4.1. Term Specificity and Innovation

Low term specificity resonates with the contractual incompleteness dimension and occurs when the contract does not specify all the verifiable obligations and actions of the parties. Drawing on TCE, Wang et al. (2011) refer to term specificity as contractual detail, and they argue that, to a certain point, well-
specified contracts reduce the costs and risks associated with knowledge exchange and collaborative innovation. Johnson and Medcof (2007) adopt an AT perspective and argue that the specification of the outcomes to be accomplished introduces the potential for innovation.

We argue that contracts that are less complete foster innovation. The PBC is characterized by low term specificity since the focus of these contracts is the desired performance, not the specific actions or resources to be used. The partner therefore has the freedom to work in whatever way they consider best and to determine their procedures within certain boundaries (Johnson & Medcof, 2007; Wang et al., 2011).

Low term specificity in the contract allows the partner more freedom. It can choose the activities to engage in and the resources to use; it therefore has a higher degree of autonomy during the day-to-day operations of the service delivery. Hence, low degrees of term specificity in the contractual design results in a higher degree of autonomy in the contract execution phase. To effectively engage in innovation, the partner should not be hindered by rigid rules and obligations (Wang et al., 2011). Autonomy is thus essential to the process of leveraging existing strengths and identifying new opportunities. It allows the partner to influence the delivery of the service and make changes to the transaction. The partner gains the freedom to innovate (Abbey & Dickson, 1983; Arad, Hanson, & Schneider, 1997) and to approach problems and performance metrics in a way that makes the most of its expertise (Amabile, 1998; Liao, Liu, & Loi, 2010; Woodman et al., 1993). The partner can draw on its own experience rather than conforming to the requirements of the less knowledgeable principal (i.e., focal firm). It may identify a promising activity that can improve performance. When an innovative activity fails, the parties can share the experience and learn from it (Dess et al., 2003).

However, although a low degree of term specificity beneficial for innovation, a certain degree of term specificity is necessary for innovation to
occur because it is aimed at reducing deviation from the existing way of conducting business through improvements in processes and outputs (Jansen et al., 2006). For example, a certain degree of term specificity facilitates the generation of ideas to improve existing ways of conducting business (Jansen et al., 2006). By incorporating contractual rules and procedures, best practices are codified to make them more efficient to exploit, easier to apply and to accelerate their implementation (Jansen et al., 2006). In addition, a certain degree of term specificity is also required to curb opportunism that might arise from the partner’s autonomy as high degrees of autonomy stimulate less committed partners to let their own interests prevail over joint interests (Shimizu, 2012). According to TCE and AT, excessively low term specificity creates the potential for the partner to act opportunistically (Eisenhardt, 1989a). Even reliable partners may not be able to resist the temptation to act opportunistically when autonomy is very high (Shimizu, 2012). Opportunistic behavior may include competitive activities or the sale of the generated (innovative) knowledge to a competitor (Kloyer & Scholderer, 2012). Thus, the overall quality and value of the innovative activities is lower when the partner has a low degree of term specificity (Shimizu, 2012). Consistent with the above, Wang et al. (2011) find that insufficient contractual detail negatively affects innovation. Hence, we argue:

**Proposition 1:** There is an inverted-U-shaped relationship between term specificity and innovation.

### 2.4.2. Pay-for-Performance and Innovation

The problem of opportunism under low term specificity is, according to AT, the principal-agent problem: the goals are misaligned (Eisenhardt, 1989a). The principal-agent problem is that, typically, the principal wants to minimize costs (such as rewards paid to the agent) and the agent wants to maximize rewards
(Fleisher, 1991). Reducing opportunism by incorporating control and coordination mechanisms and thereby suppressing autonomy is not ideal for innovation. With such mechanisms the contract will prescribe roles and obligations, determine the content of the transaction, and specify penalties for contractual violations (Argyres & Mayer, 2007; Poppo & Zenger, 2002). This results in a rigid relationship that hinders innovation (Arad et al., 1997; Wang et al., 2011). These mechanisms may also control the knowledge transfer between the parties, thereby inhibiting innovation (Wang et al., 2011). Thus, although TCE prescribes to implement control and coordination mechanisms to suppress opportunism, this comes at the expense of innovation. As such, other mechanisms are needed to simultaneously suppress opportunism and foster innovation. AT proposes to use financial compensation systems to control opportunism (Bloom & Milkovich, 1998; Eisenhardt, 1989a; Makri et al., 2006). AT is the principal theory guiding organizational research on the effects of compensation on relationship outcome (Bloom & Milkovich, 1998; Roth & O’Donnell, 1996; Stroh et al., 1996). It is concerned with the structuring of monitoring and compensation systems in principal-agent relationships. Compensation systems are a mechanism through which many goals are pursued. They provide incentives to adopt efficient behavior, promote efficient adaptation, and balance different types of hazards (Furlotti, 2007). The goal is to induce agents to meet the objectives of their principals (Bloom & Milkovich, 1998; Eisenhardt, 1989a; Makri et al., 2006; Shimizu, 2012). Such incentive schemes are the second characteristic of PBCs (Kim et al., 2007). Through these schemes, the contract rewards the partner based on outcomes that are closely related to the partner’s efforts via incentives.
to meet performance goals (Argyres & Mayer, 2007; Lyons, 1996). If the rewards are linked to behavior or the resources used, the partner will be discouraged from engaging in activities that will not be rewarded such as innovation (Deckop, Mangel, & Cirka, 1999). In these cases, the partner limits himself to perform only those activities and behaviors that are specified in the contract and for which the partner will be paid. In the most extreme case, any new initiative would be a breach of contract (Johnson & Medcof, 2007). On the other hand, when rewards are linked to performance, as in PBCs, the partner is induced to behave in the interest of the contracting party and create incentives to engage in (new) activities that improve performance. There is an incentive to innovate because the increased net profits accrue to the partner. Therefore, the partner will invest in performance improvement via innovative activities, anticipating that the incentive payment will offset the investment cost (Heinrich & Choi, 2007). Indeed, researchers have shown that financial incentives are related to opportunity identification and innovation (Abbey & Dickson, 1983; Johnson & Medcof, 2007; Shepherd & DeTienne, 2005). Linking rewards to performance will direct the partner toward collaborative goals even when there is a possibility to behave opportunistically (Devers et al., 2007; Eisenhardt, 1989a; Makri et al., 2006; Shimizu, 2012). Accordingly, we argue that paying for performance positively affects innovation. Hence, we propose the following:

**Proposition 2:** There is a positive relationship between paying the partner based on its performance and innovation.

According to AT, an optimal reward scheme depends on the degree of risk-averseness of the partner (Eisenhardt, 1989a; Levinthal, 1988), and this should be taken into account (Bloom & Milkovich, 1998). When the partner is paid based on performance, rather than the process used, its liability increases (Gates et al., 2004). It has more responsibility and bears more risk because its income
stream is uncertain (Gruneberg, Hughes, & Ancell, 2007; Guajardo, Cohen, Kim, & Netessine, 2012; Kim, Cohen, Netessine, & Veeraraghavan, 2010; Ng & Nudurupati, 2010). Financial risks are incurred as a result of e.g., defects, failure to meet completion deadlines, and quality issues.

Since attitudes toward risk differ among organizations, we argue that the level of innovation is lower for a risk-averse partner. Risk-averse partners are willing to sacrifice some of the expected return in order to minimize their risk (March & Shapira, 1987; Singh, 1986). They will therefore opt for status-maintaining decisions, by favoring solutions that have been proven to work well over high-risk options (Ederer & Manso, 2013). When a risk-averse partner’s payment is linked to its performance, the partner may make conservative decisions and establish greater cost control at the expense of creative freedom. This may result in fewer resources being devoted to innovative activities, since innovation is inherently risky (Bloom & Milkovich, 1998; Makri et al., 2006). Eisenmann (2002) observed that agents (i.e., the partner) choose to avoid risky projects to improve the odds that they will meet performance targets. Thus, we suggest that the partner’s degree of risk-averseness moderates the relationship stated in Proposition 2. All else being equal, a risk-averse partner will engage in fewer innovative activities. Accordingly, we propose the following:

**Proposition 3:** The more (less) risk-averse the partner, the weaker (stronger) the positive relationship between the partner being paid based on its performance and innovation.

These proposed relationships, which are captured in a conceptual model (Figure 2.1), shed light on the mechanisms that underlie the causal relationship between PBC and innovation. We argue that PBCs are characterized by low term specificity and rewards that are linked to performance. The relationship between term specificity and innovation follows an inverted U-shape: neither too high,
nor too low term specificity is beneficial for innovation. In addition, we argue that when the partner is paid based on performance, it is incentivized to behave in the interest of the focal firm and engage in innovation activities. We therefore expect that linking rewards to performance positively affects innovation. Finally, we postulate that, all else being equal, the more risk-averse the partner, the less it will engage in innovative activities. Hence, we argue that the partner’s degree of risk-averseness negatively moderates the positive relationship between pay-for-performance and innovation.

**Figure 2.1:** Conceptual Model: Relationship between PBCs and Innovation

![Conceptual Model: Relationship between PBCs and Innovation](image)

### 2.5. Discussion and Conclusion

Although extant research has mostly addressed the negative effects of (incomplete) contracts on relationship outcomes, we focus on innovation as a positive effect of incomplete contracts. Specifically, we consider how the characteristics of a specific type of incomplete contract, the PBC, affects innovation. A PBC has two typical characteristics. First, it specifies the
performance to be attained rather than the inputs and processes to be used. PBCs are therefore characterized by low term specificity in comparison to behavior-based contracts, which prescribe the resources and the delivery. Second, PBCs, to a large extent, reward the partners for their performance (pay-for-performance). Various authors have suggested that PBCs have a positive effect on innovation (Kim et al., 2007) but have not explained how this effect may occur. In explaining how an incomplete contract such as the PBC affects innovation, we draw on two theories. This is in contrast to prior studies of contractual governance in relation to performance, which are usually based on a single theory. First, TCE suggests that the relationship between term specificity and innovation has an inverted U-shape. We argue that when term specificity is too high or too low it will not lead to the highest possible levels of innovation. Hence, the effects of term specificity on innovation seems to become negative beyond a certain point. Second, we argue that linking the partner’s reward to its performance positively affects innovation. According to AT this incentivizes the partner to behave in the interest of the focal firm and to engage in (new) activities that improve performance. However, we suggest that a risk-averse partner will engage in fewer innovative activities when it is faced with risk when being paid for its performance.

Our propositions have a number of theoretical implications that build on and extend prior research on TCE and AT. Past research has tried to link these two theories in governance research in general, and the effects of contracts on performance in particular. However, to our knowledge, few attempts have been made to combine the two theories to explain the effects of (incomplete) contracts on innovation. Our study therefore adds to the limited stream of research on the effects of formal governance on performance (Malhotra & Lumineau, 2011). First, our study shows that term specificity and reward schemes have an effect on innovation outcomes. The relationship between term specificity and innovation seems to have an inverted U-shape. The form of this
relationship suggests that there is an optimal level of contractual completeness that maximizes innovation: neither too high nor too low degrees of term specificity are beneficial for innovation. When term specificity is too low, the partner might be stimulated to engage in opportunistic behavior. Nevertheless, reducing opportunism by incorporating control and coordination mechanisms, as proposed by TCE, and thereby suppressing autonomy is not ideal for innovation. AT on the other hand proposes solving the problem of opportunistic behavior by paying the partner based on its performance. These differing solutions indicate the importance of considering both theories collectively rather than separately. This also explains why PBCs may be effective in fostering innovation: the typical characteristics of PBCs allow for the interdependent application of both solutions. For example, altering the term specificity affects the need for pay-for-performance to protect against partner opportunism, whereas adopting pay-for-performance allows lower term specificity.

The results of this research are relevant to practitioners as well. Note however, given the conceptual nature of this chapter, and thus no empirical results, managers should read the implications with caution. Our propositions imply that contracts should grant the partner the autonomy necessary (through a lower degree of term specificity) to engage in innovation. This means that managers need to avoid prescribing activities and resources in detail. This will be challenging, since they usually favor describing the contract in detail. Nevertheless, managers should note that a very low degree of term specificity can result in opportunistic behavior. Hence, there should be a certain degree of term specificity in the contract. They can also mitigate this risk by considering reward schemes; linking rewards to performance induces partner relationships to move towards innovation. Third, because risk-averse partners are less responsive to pay-for-performance, managers should carefully investigate the partner’s risk attitude before engaging in a PBC. Finally, despite our focus on PBCs, we believe that our findings hold for other contracts as well. Most
contracts contain both behavior-based and performance-based elements. Term specificity can be varied in any type of contract. Similarly, pay-for-performance elements can be introduced in any type of contract. The lower the term specificity, the more closely the contract will resemble a PBC, especially when rewards to a great extent are linked to performance.

Given that the focus of this study is on formal governance, other factors that may influence innovation in an IOR were not addressed. However, IORs in which incomplete contracts are used rely on complementary instruments of governance such as relational governance (Al-Najjar, 1995). In addition to having a sound contract, the parties should emphasize relational attributes such as trust, communication, and commitment (Gardet & Mothe, 2011; Mohr & Spekman, 1994). These attributes could affect innovation. For example, communication involves close interaction between individuals that might result in the sharing of knowledge. This sharing can positively affect innovation (Im & Rai, 2008). Future research could therefore seek to explore in more detail the interaction between (performance-based) contracts and relational governance rather than researching the effects of one of the two governance methods on innovation. Hence, the focus should not only be on studying the effects of these governance modes on innovation, rather, researchers should also emphasize the effects of contracts on relational governance and the other way around. This limitation will be addressed in chapter 5 of this dissertation. A second limitation is that this chapter focuses only on innovation. Future research should consider other outcomes such as financial performance (e.g., profits) and relational outcomes (e.g., satisfaction about the IOR). Organizations may make explicit contractual trade-offs that favor one positive outcome over another.

There are several interesting avenues for future research. First, future research could study the effects of different pay-for-performance schemes on innovation. As previous research in intra-firm settings has shown, different schemes such as stock ownership and stock options have different effects
(Sanders, 2001; Shimizu, 2012). Similarly, in an inter-firm setting one could explore the innovation effects of pay-for-performance schemes such as bonuses and innovation incentives. Furthermore, Proposition 3 argued that the effectiveness of pay-for-performance depends on the partner’s risk-averseness. Risk-averseness may also directly moderate the relationship between term specificity and innovation, since low term specificity increases the partner’s responsibility for the design of the transaction. Axelsson and Wynstra, (2002) argue that under incompleteness, the partner must be willing to deal with the risk that comes with increased responsibility. Finally, the propositions should be considered in relation to the service type, the industry type, and the nature of the transaction.
CHAPTER 3

What You See in the Contract is Not Necessarily What You Get: The Importance of Granted Autonomy for Achieving Innovation in Performance-Based Contracting\textsuperscript{14, 15}

Performance-based contracts (PBCs) are increasingly being adopted by organizations that partner with providers of business services. Given that some PBCs lead to innovation and others do not, this study tries to understand what the underlying mechanisms are that allow for successful innovation. This study presents the results of two cases of inter-organizational relationships (IOR) governed by PBCs to shed light on how the characteristics of this type of contract affect innovation. The two PBCs both concern sourcing IT services, but they differ with regard to innovation performance. Data is collected from both sides of the IOR.

The aim of this study is not to test the conceptual model developed in the previous chapter. Rather, this study refines the conceptual model, as there might be other variables in play that could not be identified by using existing literature and theories only. By using in-depth case research, this study tries to identify variables that could explain why certain PBCs lead to innovation and others do not. As we are looking into PBCs, which have low degrees of term specificities, we only looked at that part of the U-curve (i.e., low degrees of term specificity).

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\textsuperscript{15} The author of this dissertation (first author of this paper) was responsible for the research question, literature search, theory development, data collection, data analysis (together with the second co-author) and the final version of this manuscript. During revision moments of this chapter, the co-authors rewrote and provided detailed feedback for the improvement of the manuscript.
3.1. Introduction

Inter-organizational relationships (IORs) have become important for organizations that wish to complement and supplement their internal innovation strategies (Chesbrough et al., 2008; Kühne, Gellynck, & Weaver, 2013; Smets, 2013; Soosay, Hyland, & Ferrer, 2008). IORs are usually governed by legal contracts: “legally bound, institutional frameworks in which each party’s rights, duties, and responsibilities are codified and the goals, policies, and strategies underlying the anticipated IOR are specified” (Luo, 2002, p. 904).

In spite of the common use of contracts, there is inconclusive evidence of their effect on innovation. Whereas some authors have acknowledged the positive effects of contracts on innovation (Johnson & Medcof, 2007; Wang et al., 2011), others have pointed at contract types that do not incentivize the focal firm’s partner\(^\text{16}\) to innovate (Gopal & Koka, 2010). Despite the lack of consensus and empirical evidence, researchers have generally suggested that, in particular, performance-based contracts (PBCs) positively affect innovation (Kim et al., 2007; Martin, 2002; Ng & Nudurupati, 2010). Note that we focus here on (performance-based) contracts in general, where contracted activities or performance (e.g., delivery, quality) may or may not be accompanied by innovations. This as opposed to innovation contracts (Beneito, 2006; Gilson, Sabel, & Scott, 2009), where innovation is the sole performance outcome. PBCs underline the outcome of the transaction rather than prescribing how to deliver it or which resources to use, and reward the partner for the extent to which these outcomes are achieved (Kim et al., 2007). PBCs are increasingly applied in both the public (e.g., infrastructure) and private sectors (e.g., logistics). However, although PBC studies are increasingly emerging (e.g., Guajardo et al., 2012;\(^\text{16}\) An IOR can take many forms, such as joint ventures, joint production, contracted R&D, and a long term buyer-seller relationship. In this paper, we address our research question from an intra-IOR perspective. Thus: ‘focal firm’ refers to an organization within the IOR (e.g., a buyer), and ‘partner’ refers to the partner of that focal firm (e.g., a seller). Finally, ‘parties’ refers to the two organizations that are part of the IOR (e.g., the buyer and the seller that form the IOR).
Kleemann & Essig, 2013; Randall et al., 2011), research into the *actual use* of PBCs and their effects remains limited (Hypko, Tilebein and Gleich, 2010; Martin, 2002). Studies of (incomplete) contracts in general have mostly focused on negative relationship outcomes such as opportunistic behavior (Williamson, 1985), and IOR failure (e.g., Park & Ungson, 2001).

We address this gap by empirically investigating how the characteristics of PBCs foster innovation. We draw on transaction cost economics (TCE) and agency theory (AT) to build arguments for how the characteristics of PBCs affect innovation. We then perform an exploratory case study of two cases, as a way of theory elaboration method to identify other variables that we have not identified yet in determining how PBCs affect innovation. Note that the aim is not to test the model developed in the previous chapter, rather we elaborate it by introducing new concepts (Ketovi & Choi, 2014). In this study, a general theoretical logic is already applied (which was developed in study 1) and we investigate this model and the empirical context simultaneously. Hence, we do not anticipate empirical findings by a priori formulation and testing of hypotheses, rather we remain open for unanticipated findings and the possibility that the developed model requires reformulation (Ketovi & Choi, 2014). The two case studies consist of performance-based IT-service contracts at one contracting organization; these contracts differ with regard to innovation performance. Our analysis is based on extensive interviews with representatives of both sides of the IOR and on analyses of the actual content of the contracts and other relevant formal documents, comprising over 1500 pages of detail. The possibility to study the actual content of the contracts in addition to other data sources is relatively unique in IOR research (Faems et al., 2008), as organizations are usually not willing to share this kind of information, and greatly enhances the quality of the analyses of an otherwise limited number of cases.
Our study contributes to existing literature in several ways. First, studying PBCs as an example of a relatively incomplete contract in relation to a positive relationship outcome (i.e., innovation) enables us to advance both the formal IOR governance and the innovation literature. As noted in the review paper of Schepker and colleagues (2014), there is a scarcity of research that focuses on performance implications of contracts. Second, it adds to the currently limited number of studies on the use and effects of PBCs (Hypko et al., 2010; Martin, 2002). Third, building our analysis on the actual content of contracts and other formal documents, such as reports from review meetings, allows us to go beyond recent empirical work that is mostly based on the degree of contractual formalization (e.g., number of contractual pages/clauses) rather than the content of the contract (Chen & Bharadwaj, 2009; Faems et al., 2008). Our research furthermore differs from mainstream IOR governance research in that we interview both strategic and operational representatives of the organizations involved. Collectively, these contributions extend and deepen our understanding of the research area in a novel and distinctive way.

The remainder of this chapter is organized as follows. First, we review the literature on (performance-based) contracting to understand how the characteristics of PBCs affect innovation. After a description of our research methodology, we present extensive within- and cross-case analyses. We conclude with a discussion of scientific contributions and managerial implications, as well as the limitations of the study and promising avenues for future research.

3.2. Theoretical Background

PBCs are increasingly being used for the effective and cost-efficient (out)sourcing of business services and integrated product-service offerings (Datta & Roy, 2011; Kim et al., 2007; Randall et al., 2011). A well-known
example is Rolls Royce’s “Power by the Hour” business model, in which they are compensated for the availability of the aircraft engines they maintain rather than for the labor and spare-part costs associated with the maintenance activities (Cohen et al., 2006; Neely, 2008). Such performance-based pricing schemes are also emerging in other service sectors such as government procurement (Behn & Kant, 1999) and logistics (Randall et al., 2011), as well as in manufacturing industries (Hypko et al., 2010; Kim et al., 2010), in which partner compensation is tied to cost savings and/or revenue-growth targets set by the customer.

Although PBC research in general covers a variety of sectors, individual studies usually bring forward highly contextual findings (Hypko et al., 2010; Kleemann & Essig, 2013; Martin, 2002). As a result, we do not yet have a common definition of PBCs across sectors. Therefore, we complement these sector-specific studies with more general studies of contractual governance, which according to Vandaele et al. (2007) are much more limited than studies of relational governance, particularly in relation to performance aspects such as innovation (Schepker et al., 2014). According to Martin (2002), sector-specific definitions of PBCs do share the same underlying concept: PBCs specify the desired performance, results, or outcomes rather than the processes and inputs needed to achieve these outcomes. This feature closely resembles low term specificity, one of the two main characteristics of incomplete contracts: not specifying all the partner’s observable obligations and actions (Bernheim & Whinston, 1998; Luo, 2002). Further, PBCs link a high degree of their partner rewards to their performance. Thus, we argue that PBCs are typically characterized by low term specificity and high pay-for-performance clauses (Hypko et al., 2010; Martin, 2002; Ng & Nudurupati, 2010). This characterization goes beyond individual sectors and features. Note that even though, compared to other contract types, PBCs are characterized by lower term specificity and high pay-for-performance clauses, within PBCs one can observe
different degrees of these characteristics. In this study, these characteristics are linked to innovation to explain the relationship between PBCs and innovation.

Building on contracting literature, in which innovation is considered an activity to be conducted by the partner (Johnson & Medcof, 2007), we define innovation to be partner-initiated, proactive undertakings that result in new or improved ways of delivering transactions. The key component of this definition is that the contracting organization taps into the partner’s entrepreneurial ideas. Both parties may benefit from the innovation: for example, when innovation results in a better service or product for the focal organization and in more efficient delivery of the transaction for the partner.

The first PBC characteristic is low term specificity. This contractual characteristic has been mentioned in both TCE and AT studies on contracting and innovation (Johnson & Medcof, 2007; Wang et al., 2011). Low term specificity gives the partners the freedom in the day-to-day operations of the service delivery to initiate innovative activities (Abbey & Dickson, 1983; Arad et al., 1997). The autonomy associated with low term specificity enables them to approach problems and performance metrics in a way that makes the most of their expertise and creative thinking (Amabile, 1998; Liao et al., 2010; Woodman et al., 1993). The partners will seek to maximize their profits by leveraging existing strengths and identifying new opportunities.

The second characteristic of PBCs is that the partner’s reward are to a large extent linked to its performance. AT researchers have emphasized the importance of appropriate compensation systems to curb partner opportunism (Devers et al., 2007; Eisenhardt, 1989a); paying for performance rewards partners for the extent to which the desired outcomes are achieved. This induces partner innovation since any increased net profits resulting from innovative activities (e.g., via the use of different resources or ways of delivering the service) accrue to the partner. Various researchers have shown that financial
incentives are related to opportunity identification and innovation (Abbey & Dickson, 1983; Johnson & Medcof, 2007; Shepherd & DeTienne, 2005).

It should be noted that AT furthermore suggests that the optimal reward scheme depends on the partner’s degree of risk-averseness (Eisenhardt, 1989a; Levinthal, 1988). Paying the partners based on performance increases their liability (Gates et al., 2004) because they have more responsibility and authority and bear more risk because their income stream is uncertain (Gates et al., 2004; Gruneberg et al., 2007; Kim et al., 2010; Ng & Nudurupati, 2010). In line with AT, we argue that risk attitudes determine behavior (Ghosh & Ray, 1997; Lee & Johnson, 2010). Risk-averse organizations will exhibit behavior associated with maintaining status, making conservative decisions, and preferring solutions with known results (Ederer & Manso, 2013). Risk-averse partners are thus less likely to engage in innovative activities (Bloom & Milkovich, 1998; Ghosh & Ray, 1997; Makri et al., 2006). In their study of managerial compensation, Ederer and Manso (2013) argue that in pay-for-performance situations, risk-averse subjects are less likely to explore and innovate than those that are less risk-averse. Hence, the effect of reward schemes on innovation is weaker when the partners are more risk-averse.

To summarize, despite the lack of consensus on the effects of contracts on innovation and the scarcity of empirical evidence, researchers have suggested that PBCs positively affect innovation. PBCs are characterized in terms of two key characteristics, low term specificity and rewards that are linked to performance. In addition, we have also discussed that the partner’s degree of risk-averseness is an important variable to consider in the study of contracts and innovation. Our study is therefore focused on four key variables: (i) innovation; (ii) term specificity (iii) pay-for-performance; and (iv) partner risk-averseness.

Following previous research, we use this theoretical background as a benchmark (e.g., Yan & Gray, 1994) to compare the data from our empirical investigation of two PBCs against this theoretical background.
3.3. Methods

3.3.1. Research Design
Although uncommon in inter-firm governance research (Faems et al., 2008), we adopt a case research strategy to explore how PBCs affect innovation. Our motivation for opting for case research is twofold. First, case research is particularly suitable for research questions with an explanatory component (Sousa & Voss, 2001; Yin, 2009). Second, studying how innovation occurs with a PBC requires detailed insight into the interactions and relationship between the two organizations; this is best obtained from qualitative data sources (Dubois & Araujo, 2007; Langley, 1999; Yin, 2009). Our unit of analysis is the IOR. Case selection preceded the development of a research protocol (Eisenhardt, 1989b; Voss, Tsikriktsis, & Frohlich, 2002), thereby enhancing reliability (Gibbert, Ruigrok, & Wicki, 2008; Yin, 2009).

To study the effects of PBCs on innovation in isolation from other potentially confounding external factors, before conducting the case studies, we first decided on the type of service to be investigated. We conducted five exploratory interviews with professionals who use PBCs to source different kinds of services (i.e., facilities, IT, marketing, maintenance, and human resources) to identify the domain from which to select our cases (Sousa & Voss, 2001). We chose IT services for two reasons. First, the use of PBCs is fairly common in this industry. Second, the industry is characterized by rapid change and short innovation cycles (Rai, Borah & Ramaprasad, 1996), which maximizes our chances of observing innovation.

We opted for two IORs governed by PBCs at a single organization. Limiting the number of cases increases the opportunity for in-depth observation (Dyer & Wilkins, 1991; Voss et al., 2002), while still providing a basis for comparison. Since applying a PBC alone is unlikely to be sufficient for innovation, we expect that there are PBC-governed IORs in which innovation does not occur. Hence, we investigated two cases that seem similar in terms of our key variables
(i.e. term specificity, pay-for-performance), but different in terms of innovative performance (i.e. more versus less innovation). Comparing a case of higher innovation with a case of lower innovation will increase our understanding of the conditions under which innovation occurs. Such insights enable us possibly *refine* (rather than test) the theoretical framework that was developed in the previous chapter.

We selected Alpha as our case company because it was willing to make the actual contracts available, thereby granting us unique research access (Yin, 2009). Alpha is a financial services firm that applies PBCs in its relationships with two IT partners, Sigma and Kappa. Sigma, an IT services firm, is responsible for the IT infrastructure of Alpha’s Asset Management division. Kappa, a telecommunications and IT services firm, is responsible for Alpha’s telecommunication and IT infrastructure. These two IORs were identified and selected by the research team in consultation with Alpha’s Chief Procurement Officer (CPO) and the Manager for Sourcing & Procurement because Alpha considered the IOR with Sigma to be characterized by more innovation and the IOR with Kappa to have less innovation. In addition, both IORs exist sufficiently long, so that performance and relationship-development data is available (Yan & Gray, 1994). Table 3.1 presents the major characteristics of both IORs.

### 3.3.2. *Data Collection*

Data was primarily collected through interviews and studies of the two contracts. Data collection involved multiple stages (Faems et al., 2008; Pentland, 1999; Pettigrew, 1990). First, we conducted unstructured interviews with two Alpha managers to obtain preliminary information about the history and characteristics of the IORs. In addition, to better understand the background of the organizations, we accessed publically available data (such as annual reports and company websites).
From May to June 2012 we conducted semi-structured interviews of 1.5–2 hours with seven different Alpha (4), Sigma (2), and Kappa (1) representatives. At both organizations in the IORs, we interviewed managers strategically involved with the PBC (sourcing and account management) and the operational employees who interact with each other in the daily service delivery. The interviews were conducted in the interviewees’ native language to maximize their ability to express their thoughts, feelings, and opinions (Faems et al., 2008). The interviews covered the period between signing the

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17 The degree of importance of the focal firm to the partners was evaluated using Sigma and Kappa interview data.
18 Data-collection at Kappa was limited to a single interview with an operational representative. Our study of the Alpha-Kappa IOR thus involved only three interviews, as opposed to the study of the Alpha-Sigma IOR, for which we conducted four interviews.
contract and present day, and were structured around the characteristics of the contract and innovative activities. We also conducted extensive analyses of the contracts and other relevant formal documents (e.g., progress reports, annual reports, and company websites). Information on the level of term specificity and the reward schemes was also obtained from the interviews, but studying the contract itself provided in-depth insight into these variables.

To ensure construct validity, we asked about concrete events rather than abstract concepts. We also tape-recorded and transcribed all the interviews; the transcripts were returned to the interviewees for verification (Yan & Gray, 1994; Yin, 2009). The interview summaries have been extensively discussed by the principal researcher and the co-authors of this chapter to further enhance their validity. As Eisenhardt (1989b, p. 538) notes, excluding the co-authors from field research and assigning them the role of devil’s advocate allows the case to be viewed from the different perspectives of multiple investigators (i.e., investigator triangulation). We also employed both source and method triangulation (Eisenhardt, 1989b; Yin, 2009). Source triangulation was achieved by asking similar questions to multiple informants on both sides of the relationships (Cardinal, Sitkin, & Long, 2004; Faems et al., 2008). Method triangulation resulted from comparing contractual data and information obtained from other documents with the interview data. By cross-checking our data we increased the reliability of our results (Frynas, Mellahi, & Pigman, 2006). Table 3.2 shows high levels of cross-source agreement for our key variables in both cases.

We documented our analysis in a case report which we shared with Alpha, and also presented our findings at an in-company seminar attended by Alpha’s CPO, the Manager for Sourcing & Procurement, and Alpha’s operational representative in the IOR with Sigma. The feedback received suggested that the picture we had obtained was accurate.
Table 3.2: Triangulation

<table>
<thead>
<tr>
<th>Construct</th>
<th>Case 1: Sigma</th>
<th></th>
<th>Case 2: Kappa</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data Source $^A$</td>
<td>Cross-Source Agreement $^B$</td>
<td>Data Source $^A$</td>
<td>Cross-Source Agreement $^B$</td>
</tr>
<tr>
<td></td>
<td>Interview</td>
<td>Archive</td>
<td></td>
<td>Interview</td>
</tr>
<tr>
<td>Term Specificity</td>
<td>1abcd</td>
<td>2</td>
<td>High</td>
<td>1abd</td>
</tr>
<tr>
<td>Pay-for-Performance</td>
<td>1abcd</td>
<td>2</td>
<td>High</td>
<td>1abd</td>
</tr>
<tr>
<td>Risk-Aversion</td>
<td>1abcd</td>
<td>-</td>
<td>High</td>
<td>1ad</td>
</tr>
<tr>
<td>Innovation</td>
<td>1abcd</td>
<td>3</td>
<td>High</td>
<td>1abd</td>
</tr>
</tbody>
</table>

$^A$: 1a = strategic manager of focal firm, 1b = operational manager of focal firm, 1c = strategic manager of partner firm, 1d = operational manager of partner firm. 2 = contract analysis. 3 = other documents (e.g., meeting reports, website, annual reports)

$^B$: High = all sources of data are in agreement; Moderate = at least two sources of data are in agreement
3.3.3. **Data Analysis**

We analyzed our data in terms of our four key variables: (i) innovation; (ii) term specificity (iii) pay-for-performance; and (iv) partner risk-averseness. For these four variables, we created indicators by drawing on existing scales (Yan & Gray, 1994). To illustrate, Table 3.3 lists the seven indicators of the innovation variable (Gallouj & Weinstein, 1997; Hertog, 2000) and the evaluations of these indicators for the Alpha-Sigma case. For example, an interviewee explained that Sigma had adjusted several IT applications to increase the reliability of the data that Alpha receives from external partners; from this we concluded that innovation occurred in the form of higher service quality (Y). Another interviewee explained that Sigma used to inform Alpha when there was a problem with the IT infrastructure, but has now created a tool that enables Alpha to instantly observe any problems. We concluded that Sigma has found “a new way of interacting with its client” (Y). Together, these two examples show that innovation has taken place in this IOR. In addition, when the interviewees did not mention changes that enabled faster service delivery by the partner, we concluded that “faster service delivery” did not occur in the Alpha-Sigma IOR (N). For term specificity we drew on the indicators developed by Argyres et al., (2007), and Ryall and Sampson (2009).

Term specificity is an element of contractual completeness. Early TCE researchers have not operationalized this variable as the focus of TCE researchers was mainly on the effects of transaction characteristics on the make or buy decision. As a result, we had to rely on the small amount of research that is available on the effects of contracts to find a good measure for term specificity. For pay-for-performance we used the items developed by Jaworski et al. (1993) which is primarily based on the agency and management control theories. Note that given that we investigate PBCs, these contracts should be characterized by reward schemes that are to a large extent linked to performance.
Table 3.3: Data Analysis for Variable Innovation (N=No; Y=Yes; NM=Not Mentioned)

<table>
<thead>
<tr>
<th>Innovation</th>
<th>Contract</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha STR</td>
<td>Alpha OPE</td>
</tr>
<tr>
<td>New service within a particular market</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>New way of interacting with the client</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>New/changed internal organizational arrangements to allow service workers to perform their jobs properly</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>New product/technology</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Faster service delivery</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Cheaper service delivery</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Higher service quality</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

In the analysis we identify whether this is the case or not (Yes or No). Examples of questions are the extent to which the provider’s rewards are linked to the outcome of the service and the extent to which the provider has sufficient financial incentives to improve the service. And finally, the indicators of risk-aversion were developed from Venkatraman (1989). Indicator questions are for example whether the provider adopts a conservative view when making major

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19 Note that innovation was evaluated using interview data only.
decisions and whether the provider has a tendency to support those projects where the expected returns are certain.

To arrive at the conclusions of whether our key variables were present (to a certain degree), the principal researcher and one of the co-authors independently analyzed the contracts, the associated appendices, and the interview data to evaluate the various indicators. First, we extracted from the interviews and the contracts all the statements relevant for the various indicators representing our focal variables. Next, we independently evaluated these qualitative statements to make claims regarding the indicators, and ultimately regarding our focal variables. The inter-rater reliability was evaluated using an unweighted Cohen’s Kappa (Cohen, 1960), and was sufficiently high (0.88). The few disagreements were resolved by discussing, integrating, and comparing our individual findings. Appendices A1 and A2 show the results for all key variables (including the individual indicators) for both cases. Term specificity and pay-for-performance were evaluated using both the contract and interview data; innovation and partner risk-averseness were evaluated using interview data only. Appendix B provides examples of interview and contract data on our key variables.

We used the overall evaluations of our key variables to conduct within-case and cross-case analyses (Diamantopoulos & Cadogan, 1996; Woolthuis et al., 2005). The within-case analyses were aimed at identifying patterns (i.e., relationships between the variables), and generated insights into how PBCs affect innovation. The cross-case analysis indicated the extent to which the patterns obtained are consistent across the two cases.

This multistage process of independent, comparative, and collaborative analysis of the data (Faems et al., 2008) resulted in in-depth multi-level insight into our research questions, enabling us to arrive at a framework that describes how PBCs relate to innovation.
3.4. Results

3.4.1. The PBC between Alpha & Sigma

Case background: From Sigma, Alpha sources the hosting of IT applications critical to the operations of Alpha’s Asset Management division, the user of the service. Asset Management invests cash resources on behalf of pension funds and institutional investors and gives them access to a wide range of financial products. There is one critical IT application within which it conducts its financial asset management activities. If this application does not function properly, the information needed to make investment decisions may be delayed or even incorrect. As a result, the clients may lose large amounts of money.

Sigma, a privately owned company with around 150 employees, hosts the critical IT application and all the supporting applications; the contract was awarded for a period of five years. At the time of this study, the contract had been in place for 1.5 years. Sigma guarantees 100% functional availability of mission-critical IT applications. It hosts a total of 15 IT applications, discloses them to 80/90 employees, and ensures that all the applications and information streams required by Asset Management operate correctly. To achieve this, Sigma works with dedicated customer account teams that design and manage the applications for each partner.

Contract characteristics: The contract consists of a single legal document supported by several appendices. It specifies the performance that Sigma must deliver: 100% functional availability of the applications hosted. The contract focuses on performance rather than on what Sigma should do or which resources it should use; we conclude that the term specificity of this contract is low. Failure to meet the specified performance will result in penalties.

20 Note here that it is not the size of the contract (in terms of number of pages) that determines the level of term specificity, but the type of specification (outcomes versus behaviors/inputs). Findings from one of our current research projects suggest that the size of the contract (number of pages) does not significantly differ for PBCs versus e.g. fixed price and cost plus contracts.
“The contract between Alpha and Sigma can be considered a PBC; it doesn’t matter how Sigma operates, as long as it delivers the necessary performance at the time that Asset Management needs it.” - Alpha operational manager

Although the contract focuses on performance, Sigma’s freedom has certain restrictions such as Alpha’s architecture policy:

Sigma will ensure that the service is in accordance with Alpha’s IT policy .... will ensure the current and future availability of a sufficient number of qualified employees with sufficient skills and knowledge of Alpha’s business and management to deliver the service .... will ensure that the environment, software, and other resources used to deliver the service do not contain “diseases” (e.g., time bombs, Trojan horses, and viruses). - Alpha-Sigma contract, Article 24.13, p. 21 and Article 30.1, p. 23

The low term specificity has implications for the execution of the contract. Alpha does not interfere in Sigma’s work, allowing Sigma to make its own decisions about the service delivery:

“We do not always ask Alpha for permission if we want to do something ... especially if we want to do something that will make our task easier (such as automating processes), since doing such things will also benefit Alpha. However, if Alpha plays a role in the process/change, then we do discuss it
because we need its involvement and consent.” - Sigma operational manager

These observations lead us to conclude that the level of term specificity enables Sigma to perform its duties in the way it thinks best. Sigma has granted autonomy, and this enables innovation:

“... the contract with Alpha is good; the basics [of the contract] are well written, but it does not specify all the details, which gives us room to innovate.” - Sigma operational manager

Sigma’s payment scheme consists of two components: a monthly fee and a one-time fee (non-recurring charge) for specific one-time projects. The monthly fee is based on a forecast of the activities that must be performed: all relevant service components have been priced by Sigma and are fully transparent to Alpha. If the scope needs to be expanded, the monthly fee will increase. Alpha pays the full monthly fee only if 100% functional availability is realized:

Sigma takes the operational responsibility for 100% functional uptime, integration with the application partners and the technical and organizational interfaces, and overall 100% availability and control [of all hosted IT elements]. If Sigma does not meet the performance goal, then Alpha is entitled to claim service credits irrespective of the cause of the downtime. - Alpha-Sigma contract, Appendix 1: Description of the Service, Article 1, p. 5 and Appendix 2: Service Level Agreements, Article 4.1, p. 13
We conclude that Sigma’s rewards are highly linked to its performance. Sigma does not receive any bonuses if it over-performs or innovates. The contract does specify service credits, i.e., penalties that Alpha may claim if the IT application is not 100% available. Such a claim was made early in the contract:

“Sigma accepts the penalties. We had a one-time failure of the system, due to human error, and it was understandable: the system had been, at that time, running for only one month. Sigma insisted we claim the penalty because the failure was their fault. I told them I understood that I should claim the penalty, but that I did not consider it necessary to do so. In the end we did claim the penalty. It felt good to know that we were collaborating with a partner that acknowledges their mistakes and keeps their promise to solve the problem.” - Alpha operational manager

Both Sigma and Alpha acknowledge that the promise of 100% functional availability involves shifting risk to Sigma. Sigma however does not consider this to be a concern:

“Risk management is very important for us. When we make [IT related] choices, we first make a risk assessment. If the partner wants to make high-risk choices [e.g., by preferring certain brands], we warn them of possible consequences. In the end, the partner decides. Because our risk management is controlled tightly, we can handle risk because we know what we are doing. So yes, there are risks, but that does not feel wrong.” - Sigma strategic manager
This statement clearly shows that Sigma deals with risk in a very conscious manner. Risk management is considered highly important, and concerns a well-developed process. The strategic manager explained that Sigma takes risk, but has also incorporated milestones (i.e., internal tests, tests by the customer) before full implementation. Sigma is thus aware of risks, but does not mind taking them, as they are used to pro-actively dealing with these risks. The operational manager confirmed that he feels Sigma is not at risk, although they do take risk. We therefore conclude that Sigma is not risk-averse.

**Innovation:** According to both Alpha interviewees, Sigma has engaged in innovative activities. Sigma tries to improve the service to surprise and satisfy the client:

“*Sigma has definitely engaged in innovative activities; it surprises us every now and then with developments that make the service better for us. For example, it incorporated a dashboard for Asset Management employees to monitor the functionality/availability of the applications. As a result, asset managers can directly monitor the IT infrastructure. I have not seen such initiatives from other partners.*” - Alpha’s strategic and operational managers

This claim is confirmed by the Sigma interviewees. However, Alpha considered the above development to be an innovation, whereas Sigma viewed it as a general service improvement:

“*Though we try to satisfy our partners with new things, we do not always consider these innovations. They are continuous*
improvements that make our services faster, easier, more reliable, and more insightful. So yes, we have engaged in innovation if you define the term broadly. For example, before Alpha contracted us, the data from Asset Management’s external partners were not transparent and not on time. The managers could not rely on this data for decision-making. We rearranged minor things in the IT applications in such a way that these are now more reliable.” - Sigma operational manager.

Although Sigma does not consider its improvements to be innovations, Alpha does. In line with our definition of innovation, we conclude that Sigma has engaged in innovative activities. We next discuss the PBC between Alpha and Kappa.

3.4.2. The PBC between Alpha & Kappa

Case background: From Kappa, Alpha sources connectivity and workstation services for all Alpha employees. Connectivity concerns all services related to (mobile) telephony and teleconferencing and to networks (e.g., LAN & WAN). Workstation services relate to employee workstations, such as setting up hardware, installing and managing software, and providing an IT helpdesk.

Kappa was founded in the late 19th century and is now a public firm with over 15,000 employees, delivering telecommunication and IT services. The contract was awarded for five years with a possible opt-out after three years: this means that if Kappa does not provide the agreed performance, Alpha can terminate the contract early. At the time of this study, the contract had been in place for about half a year.
Contract: The contract consists of a single legal document supported by several appendices. It states that a certain level of performance must be achieved for all services delivered but does not state how services should be delivered or which resources should be used. Hence, the term specificity is low:

*Kappa will deliver the services according to the agreed performance, which is an outcome obligation. Kappa will use its available expertise and experience to provide the services ... Kappa will ensure that it has a sufficient number of qualified employees allocated to the service delivery with sufficient skills and knowledge of Alpha’s business.* - Alpha-Kappa contract, Article 5.1, p. 12 and Article 7.1, p. 20

The contract describes the services to be delivered and the associated boundary conditions, resulting for example from Alpha’s existing IT architecture (bracketed text added by authors):

“*[Kappa decides how to deliver the services and which resources to use.] ... Alpha decides the IT enterprise architecture. Alpha’s enterprise architects translate this into certain IT boundary conditions.*” - Alpha operational manager

Thus, within certain boundaries, Kappa has the autonomy to operate as it chooses. However, both the Kappa and Alpha interviewees stated that Kappa’s granted autonomy is limited:

“*Alpha does not tell us how we should deliver the service, but in certain areas it interferes. In my opinion, Alpha’s enterprise architects interfere too much with what we do .... If you are an*
enterprise architect you should be concerned with high-level IT design and have a long-term perspective, not a focus on every minor change Kappa incorporates.” - Kappa operational manager

“... there is a limit on the amount by which Kappa can deviate from these boundary conditions [set by Alpha’s enterprise architects], and the openness of Alpha’s enterprise architects to deviations from the IT enterprise architecture is limited ... which has certain implications for Kappa’s innovative activities.” - Alpha operational manager

These observations lead us to conclude that although the contract design has low term specificity, Kappa’s granted autonomy during the day-to-day operations of the service is limited. The Alpha manager states that this impacts Kappa’s engagement in innovative activities.

Kappa’s reward scheme is as follows: price * quantity * service level. This means that Alpha pays Kappa for every service, user, work station, mail box, etc., depending on the service levels achieved. Hence, Kappa’s reward schemes are related to its performance. Furthermore, one of Alpha’s objectives in this contract is to reduce costs. However, assuming that service levels must be maintained and given that Alpha expects Kappa to lower its prices, Kappa’s only option for maintaining its revenue is to increase volume. At the same time, Alpha wants Kappa to renew its service package, and this may result in the termination of certain services such as landlines. To ensure that Kappa adheres to this requirement, Alpha has made the following arrangements regarding contract renewal:

“Alpha does not provide bonuses if Kappa innovates, but Kappa will receive a penalty in the form of no future business if
it does not achieve the agreed cost reductions.” - Alpha operational manager

If Kappa underperforms, it will not be awarded new business. This penalty is linked to Kappa’s performance, and hence it can be viewed as a negative reward. Hence, Kappa’s rewards are highly linked to its performance. This also suggests that Kappa is confronted with a substantial level of risk. First, underperformance will lead to reduced revenue. Second, if Kappa does not make a sufficient contribution to Alpha’s cost-reduction objective, Alpha may decide to seek a new partner, possibly after three years. Kappa would then lose both future business and some or all of its current business with Alpha:

*If Kappa does not perform according to what was agreed in the contract, Alpha has the right to partly end the relationship three years after the starting date, provided that Alpha gives at least three months’ notice. Alpha will then be obliged to buy-out the remaining contract term by paying an amount that equals 10% of the “connectivity part” revenue.* - Alpha-Kappa contract, Article 4.2, p. 11

In this contract excerpt, “Partly” refers to the fact that the contract may not be completely terminated: Alpha might decide to terminate only some of the services that Kappa provides.

Kappa has accepted this risk although it is a large, traditional, and conservative company and so is inclined to be reactive and to avoid risk:

*“Kappa is protective of its investments and seeks to maintain volume rather than increase margins on new or improved service delivery. It does not want to take the risk of losing*
This shows that we are dealing with a partner with limited innovation.” - Alpha strategic manager

This statement shows that Kappa is more inclined towards protecting their current business rather than engaging in new activities. We observed from the interviews that Kappa is more focused on supporting projects where expected returns are more certain. We therefore conclude that Kappa is a risk-averse organization.

**Innovation:** Kappa has not engaged in innovative activities. This was reflected in the statements from the interviewees of both parties:

“Kappa is sometimes reactive, sometimes proactive. We want them to be proactive, but that is a game that Kappa has yet to learn. [Being proactive] is not the way Kappa conducts business.” - Alpha strategic manager

“[These are the reasons that Kappa has not engaged in new initiatives.] First, we are focused on the continuity of the service rather than on innovative activities. Second, Alpha and Kappa are in the middle of a transition process involving service improvements. Because the current [IT] environment is complex and old, it is difficult to renew the environment and speed up the transition. Third, Alpha’s decision-making is slow. ... there are too many parties [within Alpha] that can interfere in the way we deliver the service. This may delay the process of getting innovations through; by the time a decision has been made, the world has changed and the innovation is outdated.” - Kappa operational manager
We conclude that Kappa does not engage in innovative activities. Neither party is satisfied with Kappa’s level of innovation.

### 3.5. Cross-Case Analysis

The results of our within-case analyses can be summarized in Table 3.4.

**Table 3.4: Cross-case Results**

<table>
<thead>
<tr>
<th></th>
<th>Case 1: Alpha &amp; Sigma</th>
<th>Case 2: Alpha &amp; Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Term Specificity</strong></td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Pay-for-Performance</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Risk-Aversion</strong></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Innovation</strong></td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td><strong>Granted Autonomy</strong></td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

We find the following similarities between the cases. Both contracts are performance-based: they have low term specificity and include pay-for-performance clauses. This clause specifies a fixed fee that is relative to performance: lower than agreed availability/service levels results in lower rewards. Since the desired service level in the Sigma case is 100%, there can be no over-performance. Hence, there are no bonuses for Sigma. For Kappa, the service levels are set below 100%, so over-performance is possible.

Although both contracts are performance-based, there are clear differences in the levels of innovation: Sigma is more innovative than Kappa. Kappa explains its lack of innovation by its limited freedom in the contract execution phase (i.e., limited granted autonomy). The interviewees argue that beyond the specified boundary conditions Kappa should be free to perform its tasks as it sees best (due to the contractual design of low term specificity), but in reality this freedom is limited. Alpha’s enterprise architects are closely involved...
with the tasks to be performed, and they focus on minor details rather than the big picture. Kappa considers Alpha to interfere with its operations.

These observations suggest that although the contract with Kappa was designed with low term specificity, this did not result in granted autonomy in the service delivery during the contract execution phase. Sigma did enjoy such autonomy and was therefore able to focus on maintaining 100% functional availability. It appears that designing a contract with the intention of autonomy is not the same as actually granting this autonomy.

Kappa’s lack of autonomy strongly affected its level of innovation. According to the interviewees, Kappa was limited in its ability to engage in new initiatives. For example, Alpha’s enterprise architects are closely involved in Kappa’s activities, limiting the development of initiatives for improvement. Moreover, all IT initiatives must be approved by Alpha’s IT division. Decision-making processes are slow in large organizations like Alpha, and initiatives were sometimes outdated by the time a decision was finally made. In contrast, Sigma’s high level of granted autonomy has clearly resulted in the freedom to innovate. Sigma continuously tries to improve its services, both to make its work easier and to improve the offering to Alpha. We thus argue that the relationship between term specificity and innovation as developed in our theoretical model is mediated by the degree of autonomy granted to the partner. A lower degrees of term specificity in the contractual design, lead to higher degrees of autonomy in the contract execution phase which in turn results in innovation. This means that it does not matter whether term specificity is at an optimal degree or very low, if the autonomy in the contract execution phase is not granted to the partner, they will be inhibited from engaging in innovation.

Furthermore, Kappa’s risk-averseness makes it less inclined to engage in innovative activities. This characteristic is partly historical: a long-time market leader, Kappa was confronted with the need for innovation only when competition was introduced in the formerly public national telecom market,
some ten years ago. Furthermore, the rise of mobile communications has been a specific threat: the development of this technology will lead to the end of landline telephony, which has long been the basis of Kappa’s revenue model. In the case studied here, Alpha wanted Kappa to update its services, as a result of which some existing services would disappear. Innovation would thus have a serious impact on Kappa’s existing activities. We found that Kappa is clearly focused on maintaining volume and does not want to take risks. Kappa’s risk-averseness did not cause the lack of innovation, but it certainly played a role. Moreover, this characteristic caused the pay-for-performance clause to be ineffective. Figure 3.1 summarizes these findings and describes the relationships between the characteristics of PBCs and innovation as developed in the previous chapter and also includes the variable that was identified in this study.

We believe that Kappa’s lack of innovation can foremost be explained by the fact that Alpha did not grant Kappa autonomy in the contract execution phase. In the Sigma case, this was not a problem. A possible explanation for the lack of granted autonomy is that Alpha and Kappa have long been partners. The prior contract however, was much more prescriptive in nature, and hence, Alpha and Kappa collaborated differently:

“We used to have contracts that were very prescriptive. In those contracts we told the partner exactly what it should do and how to do it; we were an inch away from telling them which resources they should use.” - Alpha operations manager

The nature of prior contract is likely reflected in the way the parties currently collaborate despite having a contract with low term specificity. When contracts are prescriptive, organizations will carefully monitor the activities being conducted by the partner (Zsidisin & Smith, 2005). This explains the level of involvement of Alpha employees in Kappa’s day-to-day operations, and the
tendency to interfere with the partner’s daily activities or ways of working. In contrast, Sigma is a new partner for Alpha. Since there was no history of past collaborations, it was easier to adopt a performance-based approach.

**Figure 3.1: Effects of PBCs on Innovation**

![Figure 3.1: Effects of PBCs on Innovation](image)

### 3.6. Discussion and Conclusion

PBCs are increasingly being used by organizations that partner with external providers of business services. However, PBCs are suggested to foster innovation, but hitherto, there is little empirical evidence for this claim.

Our study adds to the limited body of knowledge on the use and effects of PBCs in particular, and of incomplete contracts in general, on positive relationship outcomes (i.e., innovation). Our results suggest that, in line with the results of our literature review, PBCs can be characterized as being low in term specificity and having rewards that are to a large extent linked to performance. Both characteristics affect innovation. Innovation occurs because of increased partner autonomy, which results from low term specificity. However, we
observe that low term specificity in the contractual design phase which should provide autonomy is not sufficient for innovation: it appears to be the granted autonomy in the contract execution phase that allows the partner to use their knowledge and experience to optimize the service process. This could be clearly observed in the PBC between Alpha and Sigma: Certain boundary conditions aside, Sigma decided on how to attain the performance target of 100% functional availability of applications. This is in contrast with the PBC between Alpha and Kappa: Kappa did not have freedom in organizing its service activities because of the enterprise architects’ interference. This prevented Kappa from being innovative. This research has therefore highlighted the importance of the contract-execution phase in addition to the contract design phase. It is important that organizations draft a well-designed contract (Argyres & Mayer, 2007), but it is at least as important to ensure that the parties follow the spirit of that contract. Note that in the previous chapter we hypothesized an inverted-U relationship between term specificity and innovation. In this chapter however, we do not make this claim because in case studies it is difficult to determine a U-relationship. Given that we have two cases of PBCs, we therefore focused on that side of the curve where term specificity is low. Nevertheless, we do argue that even on the other side of the inverse U-curve, granted autonomy is a mediating variable. More specifically, on the other side of the inverse U-curve, when term specificity is high, granted autonomy will be lower which will result in lower degrees of innovation.

Furthermore, the results suggest that in both contracts, Alpha pays the partner based on performance rather than the number of hours worked or the costs involved. In line with theory, we observe that this arrangement seems to create incentives to engage in new activities that improve performance. Sigma engages in such activities but the arrangement did not work for risk-averse Kappa. This suggests that paying the partner based on performance may lead to
innovation only for non-risk-averse partners. As such, we have shown how to collectively use these two different mechanisms to promote innovation in IORs.

Our results suggest that the contract affects a partner’s incentives and its perceptions of risk and subsequently its ex-post managerial decision-making. When applying PBCs, organizations should collaborate with their partners in the spirit of the contract; granting the autonomy the partner needs to optimize their processes and activities. In addition, given that the risks of uncertain income streams shift to the partner and that risk-averseness affects innovation, managers may want to carefully investigate the partner’s risk attitudes before engaging in incomplete contracts such as PBCs.

Despite the merits of this research, a few criticisms may be raised. First, studying only two cases allowed us to extensively analyze contracts and other documents in addition to interview data, thereby enabling an in-depth investigation (Dyer & Wilkins, 1991; Voss et al., 2002). At the same time, limiting our study to one specific focal company and one specific type of service creates the possibility of context-specific findings. For example, IT partners may be more inclined to innovate than maintenance partners, whose activities are usually more routine-like in nature. Our research should therefore be replicated for other industries and services with more cases.

Second, our study focuses on the effects of formal control on innovation and does not address other factors that may influence innovation, such as relational governance. IORs governed by incomplete contracts require other governance instruments such as the relationship (Al-Najjar, 1995). By keeping the contract open, organizations demonstrate that they trust their partners to deliver the service according to the agreed performance. Relational aspects such as trust, communication, and commitment therefore become important (Kühne et al., 2013; Mohr & Spekman, 1994). For example, the interviewees in the Alpha–Sigma case emphasized the importance of the relationship via phrases such as “we can contact each other directly at any time,” “we meet often even
when it is not necessary,” and “it feels like friendship.” These relational attributes could also affect innovation; parties that interact closely share know-how, which can positively affect innovation (Im and Rai, 2008). Future research could therefore explore the interaction between (performance-based) contracts and relational governance elements as the success of an IOR is dependent on relational governance as well. Given the importance of relational governance, this dissertation responds to this call by including this governance mechanism in the model as well in chapter 5.

There are several interesting avenues for future research. First, although existing literature seems to assume that there is a one-to-one relationship between contractual incompleteness and partner autonomy (Al-Najjar, 1995; Bernheim & Whinston, 1998; Kim et al., 2007), reality has more nuances as our study shows that there is a difference between suggesting autonomy in contract design and granting autonomy in contract execution. Future research should therefore clearly separate the creation of autonomy (in contract design) from allowing actual autonomy (in contract execution). The next chapter tried to incorporate granted autonomy in the empirical model. However, the validity and reliability of the items we used for measuring granted autonomy were not good enough to incorporate them in the model, which resulted in excluding this variable from the theoretical and empirical models by assuming that there is a one-to-one relationship between term specificity and autonomy (see the next chapter for an elaborate discussion on this issue). Nevertheless, given the findings of this chapter, we do urge future researchers to develop a valid and reliable scale for granted autonomy and to include this variable in their theoretical and empirical models.

Second, our propositions could be developed into testable hypotheses, which could then be investigated by means of large-scale follow-up studies in the form of surveys, which this dissertation responds to in the following chapter. The hypotheses could also be tested via in-depth contractual analyses, as to
respond to the need for analyses based on contractual content (Chen & Bharadwaj, 2009; Faems et al., 2008).

Furthermore, as noted before a possible explanation for Kappa’s lack of autonomy could be that in their previous collaborations they had prescriptive contracts. This could imply that, despite the lower term specificity in their new contract, the more prescriptive contract of the previous collaboration could still affect the way these partners conduct business. Our rationale for modeling the contract as an antecedent to IOR collaboration is that behaviors are usually regarded as consequences of a state, here: the contract. However, future research could be directed at whether and how the collaboration’s history affects contract design and contract execution.

Finally, innovation literature differentiates between radical and incremental innovation. Future research could test whether our propositions hold for both types of innovation. One might argue that term specificity and pay-for-performance might have different implications for incremental innovation, where the focus is on exploiting existing products/services, versus radical innovation, where the focus is on exploring new products/services. The following chapter responds to this call by differentiating between incremental and radical innovation.
Fostering Incremental and Radical Innovation through Performance-Based Contracting in Inter-Organizational Relationships

Anecdotal evidence suggests that performance-based contracts (PBCs) may positively affect innovation in inter-organizational relationships, but empirical evidence is lacking. This study’s objective is therefore to empirically test how the main characteristics of PBCs affect innovation by using survey data from 106 IORs in the Dutch maintenance industry. Data is collected from both sides of the IOR.

This study empirically tests the model developed in the previous studies. Note that the model tested in this study is more elaborate than the models developed in the previous studies. This study distinguishes between incremental and radical innovation to empirically validate the premise that antecedents that are favorable for one type of innovation may be unfavorable for the other.

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21 This research was conducted in collaboration with Van der Valk (2nd author), W., Van Weele, A. (3rd author), and Bode, C (4th author). An earlier version of this chapter was presented at the 2014 AoM (Philadelphia, USA) and IPSERA (South-Africa) conferences. An adapted version of this chapter is under review for publication in a supply chain management journal, has won the ‘Best Paper Award’ at the IPSERA 2014 conference and has been published in the ‘Best Paper Proceedings of the Academy of Management Conference 2014’.

22 The principal researcher of this dissertation (who is the first author of this paper) was responsible for the research question, literature search, theory development, data collection, data analysis (together with a co-author) and the final version of this manuscript. During revision moments of this chapter, the co-authors rewrote and provided detailed feedback for the improvement of the manuscript.
4.1. Introduction

Formal governance seems to be important in safeguarding inter-organizational relationships (IOR) from opportunistic behavior and failures. However, compared to studies into relational governance, research on the performance effects of contracts is limited (Schepker et al., 2014), especially in relation to innovation, a fundamental yet under-researched element of the value-creating potential of IORs (Adams et al., 2006; Faems et al., 2005; Wang et al., 2011). The research that does exist is largely inconclusive: while some authors claim that contracts positively affect innovation (Johnson & Medcof, 2007; Wang et al., 2011), others have found no evidence for this effect (Gopal & Koka, 2010).

We therefore study the effects of contracts on innovation, more specifically, the effects of Performance-Based Contracts (PBCs). A PBC is a contract that arranges for the outcome of the transaction rather than prescribing how to perform the transaction or what resources to use (Kim et al., 2007). PBCs are characterized by low term specificity (i.e., the contractual clauses related to obligations and behaviors are not specified in detail) and the partner’s rewards that are to a large extent linked to which the outcomes are achieved. The reason for focusing on this type of contract is twofold. First, PBCs have been claimed to positively affect innovation (Kim et al., 2007; Martin, 2002; Ng & Nudurupati, 2010), but this argument lacks empirical validation. Second, as PBCs are increasingly being adopted by practitioners (Hypko et al., 2010; Martin, 2002) with varying degrees of success, an empirical investigation of their effects is needed to guide effective contracting behavior.

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23 An IOR can take many forms, such as joint ventures, joint production, contracted R&D, and a long term buyer-seller relationship. In this paper, we address our research question from an intra-IOR perspective. Thus: ‘focal firm’ refers to an organization within the IOR (e.g., a buyer), and ‘partner’ refers to the partner of that focal firm (e.g., a seller). Finally, ‘parties’ refers to the two organizations that are part of the IOR (e.g., the buyer and the seller that form the IOR).

24 Note that we focus here on (performance-based) contracts in general, where contracted activities or performance (e.g., delivery, quality) may or may not be accompanied by innovations. This as opposed to innovation contracts (Beneito, 2006; Gilson, Sabel, & Scott, 2009), where innovation is the sole performance outcome.
Our analysis of PBCs is informed by the literature on incomplete contracting. Like any contract, PBCs are usually incomplete in that they do not include contractual terms for all possible future events (Saussier, 2000; Williamson, 2008), simply because these events cannot be foreseen or efficiently described (Hart & Moore, 1999; Mayer & Argyres, 2004). In addition, because of the focus on outcomes, PBCs contain less contractual detail regarding the specification of processes, behaviors, and inputs. Consequently, PBCs are relatively more incomplete than other contract types, such as fixed-price and cost-plus contracts. Relative to more complete contracts, incomplete contracts (such as PBCs) offer two important benefits. First, they are more flexible in the sense that they allow for contingency adaptability (i.e., they allow the partner to make changes deemed necessary to deal with unforeseen circumstances) (Bernheim & Whinston, 1998; Luo, 2002). Second, they provide the partner with more freedom in the contract execution phase to organize the processes surrounding the transactions in the way it thinks best (Bernheim & Whinston, 1998; Luo, 2002). Whereas the prescribing nature of more complete contracts may inhibit innovation (Hart, 1989; Wang et al., 2011), the open nature of incomplete contracts is expected to foster innovation.

However, the problem with incomplete contracts is that they do not sufficiently address the transaction characteristics that may result in opportunistic behavior (Williamson, 1985). From a transaction cost economics (TCE) perspective, this partner opportunism should be countered by opting for a more complete contract. This however may negatively affect innovation, because more contractual detail restricts the partner’s freedom to identify new solutions. Alternatively, agency theory (AT) suggests that the problem of opportunistic behavior may be solved by linking the partner’s rewards to its performance (Eisenhardt, 1989a). Thus, these two theories provide different solutions for curbing opportunism, with differing consequences for innovation. As a result, we need to consider these theories collectively rather than separately.
to understand the effects of (incomplete) contracts on innovation. The typical characteristics of PBCs (i.e., low term specificity and rewards that are linked to performance) allow for the interdependent application of both solutions.

We thus draw on TCE and AT to empirically study the effects of the characteristics PBCs on innovation. We make a distinction between incremental and radical innovation. Various authors have asserted that organizational antecedents that are favorable for one type of innovation may be unfavorable for the other (de Brentani, 2001; Koberg et al., 2003), but empirical studies have provided mixed results (Jansen et al., 2006). A lack of differentiation between the different types of innovation might explain why existing studies have not converged to a conclusion about how and which contracts foster innovation. Thus, the evidence on how formal governance affects the different types of innovation remains inconclusive. Whereas radical innovation entails developing a completely new product/service or making a fundamental change in the configuration of existing products/services, incremental innovation involves minor improvements or adjustments in existing products/services (Azadegan, Dooley, Carter, & Carter, 2008; Dewar & Dutton, 1986; Roy et al., 2004). Using both TCE and AT, we develop our research model, from which our hypotheses are derived. These hypotheses are tested using a survey-based research approach: we collected data on 106 IORs from the Dutch maintenance industry.

Our study makes several theoretical contributions. First, by studying the effects of contracts on a positive IOR outcome, we address a gap identified in previous studies (i.e., the performance implications of contracts) (Anderson & Dekker, 2005; Schepker et al., 2014; Vandaele et al., 2007). Moreover, our study adds to the limited number of studies on the use and effects of PBCs (Hypko et al., 2010; Martin, 2002). Third, our hypotheses are based on the use of both TCE and AT. Whereas previous research has used these theories separately to understand the effects of governance on outcomes (Anderson & Dekker, 2005; Johnson & Medcof, 2007; Wang et al., 2011), our empirical study
uses them collectively to understand the performance implications of (incomplete) contracts. Finally, our focus on innovation as a performance outcome constitutes a contribution to the innovation literature (Anderson & Dekker, 2005). Our distinction of incremental and radical innovation is an additional contribution to the innovation literature.

This chapter is organized as follows. First, we review the literature on innovation and (performance-based) contracts to build a preliminary framework that outlines how the characteristics PBCs affect innovation. Then, we describe our research methodology, analyses, and results. We end with concluding remarks and a discussion of the scientific contributions and managerial implications, as well as the limitations and avenues for future research.

4.2. Theoretical Background

4.2.1. Performance-Based Contracts and Innovation

PBCs are increasingly used for the effective and cost-efficient (out)sourcing of business services and integrated product-service offerings (Datta & Roy, 2011; Cohen et al., 2006; Kim et al., 2007). PBCs focus on the outputs and outcomes, i.e., the performance to be delivered by the partner (Kim et al., 2007; Mirzahosseinian & Pipani, 2011). For example, under a PBC, the partner providing maintenance of an airplane’s turbine engine is not rewarded according to the materials used (e.g., spare parts) or the activities conducted but for the uptime of the engine (i.e., “power by the hour”) (Neely, 2008; Ng et al., 2009). Thus, the contract explicitly identifies the performance that should be delivered by the partner (e.g., the uptime percentage), rather than describing how to achieve this performance: the partner decides how the targeted performance may best be obtained. The partner has the autonomy in the contract execution phase to engage in new and improved ways of delivering the service. It may also be in the partner’s interest to engage in innovative activities by investing in new
products/services and/or more efficient ways of delivering the service (Kim et al., 2007). Such performance-based pricing schemes are also emerging in other sectors such as logistics: the partner’s compensation is tied to cost savings and/or revenue-growth targets set by the focal organization. This shift toward contracting performance, which is replacing traditional contracting practices, is a trend that can be identified in both the manufacturing and service industries and in both the private and public sectors (Hypko et al., 2010; Kim et al., 2007).

TCE proposes that the IOR can be protected by the degree of contractual completeness, and AT focuses on the way the partner is rewarded. PBCs can be characterized in terms of these two solutions to partner opportunism: low term specificity and the extent to which the partner’s rewards are linked to performance (i.e., pay-for-performance) (Hypko et al., 2010; Martin, 2002; Ng & Nudurupati, 2010). Note that even though, compared to other contract types, PBCs are characterized by lower term specificity and pay-for-performance, within PBCs one can observe different degrees of these characteristics. These two characteristics may each foster innovation, as we will explain later. First, we define innovation as an activity to be conducted by the partner (Johnson and Medcof, 2007). This definition is derived from the contracting literature, where innovation refers to partner-initiated, proactive undertakings that result in new or improved ways of delivering transactions. The key premise of this definition of innovation is that the focal organization taps into the partner’s entrepreneurial ideas (Shimizu, 2012). Both parties may benefit from the innovation: for example, when innovation results in a better service or product for the focal organization and in more efficient delivery of the transaction for the partner. In this study, we conduct more detailed analyses by distinguishing between incremental and radical innovation. Incremental innovation refers to minor improvements or adjustments in the existing products or services and involves the use of existing knowledge (i.e., exploitation) (Dewar & Dutton, 1986). Examples are quicker or alternative forms of service
delivery or other small improvements in the delivery. Radical innovation involves engaging in new knowledge domains (i.e., exploration) to develop a new product/service or to fundamentally change the configuration of existing products/services (Das & Joshi, 2007; Dewar & Dutton, 1986; Roy et al., 2004).

4.2.2. Direct Effect of Term Specificity on Incremental and Radical Innovation

Although a low level of term specificity (also “contractual detail/completeness”) is a key characteristic of a PBC, PBCs may still differ in this regard. For example, in the logistics service industry, PBCs may include clauses that specify the usage of subcontractors (e.g., only certain carriers), certain modes of transportation, or certain processes (e.g., picking processes in a warehouse).

Term specificity has been considered in both TCE and AT studies on contracting and innovation. From a TCE perspective, Wang et al. (2011) argue that very detailed contracts may hamper existing knowledge exchange and innovation because of the clear contractual specification of what is and is not allowed. Similarly but from an AT perspective, Johnson and Medcof (2007) argue that specifying only the desired outcomes, as is the case in PBCs, allows the partner room for innovation. Thus, both perspectives suggest that there is a relationship between term specificity and innovation and, more specifically, that relatively low levels of term specificity should foster innovation. The key argument is that low term specificity in the contract design gives the partner both the autonomy to decide how to attain the agreed performance goals and the control over the processes and procedures of its work in the day-to-day operations of the service delivery (Bailyn, 1985; Das & Joshi, 2007; Raelin, 1989). The larger autonomy in the contract execution phase enables the partner to approach problems and performance metrics in a way that makes the most of its expertise and creative thinking (Amabile, 1998; Liao et al., 2010; Woodman et al., 1993).
With regard to incremental innovation, low term specificity gives the partner the autonomy to exploit existing knowledge. It will have an incentive to maximize its profits by leveraging existing strengths and identifying new opportunities within existing knowledge domains. However, there is a caveat: incremental innovation also requires a certain basis (e.g., existing knowledge, processes) that specifies the baseline about how to achieve the desired performance output. Although autonomy is beneficial for incremental innovation, a certain degree of term specificity is necessary for incremental innovation to occur because it is aimed at reducing the variance in the existing way of conducting business through incremental improvements in processes and outputs (Jansen et al., 2006). By incorporating contractual rules and procedures, best practices are codified to make them more efficient to exploit, easier to apply and to accelerate their implementation (Jansen et al., 2006). In addition, a certain degree of term specificity is also required to curb opportunism that might arise from low degrees of term specificity as high degrees of autonomy stimulate less committed partners to let their own interests prevail over joint interests (Shimizu, 2012). Consistent with the above, Wang et al. (2011) find that insufficient contractual detail negatively affects innovation. Hence, we expect an inverted-U-shaped relationship between term specificity and incremental innovation.

With regard to radical innovation, however, very low levels of term specificity should not stall the output of innovations. In contrast, very low term specificity enables the partner to exchange and generate new knowledge (Wang et al., 2011). In line with previous research, which has shown that high autonomy promotes the development of new knowledge (and thus radical innovation) (Choo & Bontis, 2002; Lumpkin & Dess, 1996; Nonaka et al., 2000), it can be argued that very low term specificity grants the partner the autonomy in the contract execution phase to engage in and support new ideas, demonstrate creativity experimentation, and take actions free of contractual
constraints. Underlying this is the notion that the partner will develop new ideas if it feels free to do so. In such circumstances, the partner is able to abandon established ways of working and to experiment with new ideas. Moreover, high autonomy fosters creativity and provides a basis for exploratory learning. Hence, the parties in the IOR should have sufficient autonomy to exchange new knowledge that may lead to radical innovation (Popadiuk & Choo, 2006). Conversely, detailed contractual rules and obligations constrain radical innovation (Jansen et al., 2006). Reliance on contractual rules and procedures hampers experimentation and ad-hoc problem-solving efforts. It reduces the likelihood that the partner deviates from existing knowledge and structured behavior, and it hinders deviation from a partner’s variation-seeking behavior (Jansen et al., 2006). Accordingly, higher degrees of term specificity constrain radical innovation. Therefore, we hypothesize:

**Hypothesis 1A:** There is an inverted-U-shaped relationship between term specificity and incremental innovation.

**Hypothesis 1B:** There is a negative relationship between term specificity and radical innovation.

### 4.2.3. Direct Effect of Pay-for-Performance and Incremental and Radical Innovation

The second characteristic of PBCs is that they link the partner’s rewards to its performance. Governance researchers have emphasized the importance of appropriate compensation systems to curb partner opportunism (Devers et al.,

We tried to incorporate granted autonomy in our model. However, the validity and reliability of the validated items we used for measuring granted autonomy were not good enough (Patterson et al., 2005) (see Appendix C for the results of the measurement model of granted autonomy). This resulted in excluding granted autonomy from our theoretical and empirical models by assuming that there is a one-to-one relationship between term specificity and autonomy rather than hypothesizing a mediating relationship between term specificity and both types of innovation. Nevertheless, given the findings of the previous chapter, we do urge future researchers to develop a valid and reliable scale for granted autonomy and to include this variable in their theoretical and empirical models.
2007; Eisenhardt, 1989a); such systems reward partners for the extent to which the desired outcomes are achieved. According to AT, linking rewards to performance is an example of an incentive scheme that can align the interests of the two parties in the IOR and reduce the potential for opportunistic behavior created by incomplete contracts (Devers et al., 2007; Eisenhardt, 1989a; Makri et al., 2006; Shimizu, 2012). Through these schemes, the contract rewards the partner based on outcomes that are closely related to its efforts by means of incentives to meet performance goals (Argyres & Mayer, 2007; Lyons, 1996). If the rewards are linked to behavior or the resources used, the partner will be discouraged from engaging in activities, such as incremental and radical innovation, that will not be rewarded (Deckop et al., 1999; Eisenhardt, 1989a). In these cases, the partner limits itself to perform only those activities and behaviors that are specified in the contract and for which it is being paid. In the most extreme case, any new initiative (incremental or radical) would be a breach of contract (Johnson & Medcof, 2007).

On the other hand, pay-for-performance induces the partner to behave in the interest of the focal firm and to engage in improved or new activities that improve performance. There is an incentive to innovate because the increased net profits accrue to the partner. Therefore, the partner will invest in performance improvement via innovative activities, anticipating that the incentive payment will offset the investment (Heinrich & Choi, 2007). Indeed, financial incentives have been demonstrated to be positively related to incremental and radical innovation (Abbey & Dickson, 1983; Johnson & Medcof, 2007; Shepherd & DeTienne, 2005). However, compared to incremental innovation, radical innovation involves higher uncertainty, complexity, and unpredictability (Cabrales et al., 2008). Radical innovation is associated with higher variability in outcomes and a higher probability of failure. Hence, radical innovation is inherently more risky than incremental innovation. However, higher net profits compensate for this high risk. One
cannot have high returns without substantial risk (Sanders & Hambrick, 2007). Since the net profits will be higher for radical innovation, we expect the positive effect of pay-for-performance to be stronger here than for incremental innovation. We thus hypothesize:

**Hypothesis 2A:** There is a positive relationship between paying the partner based on its performance and incremental innovation.

**Hypothesis 2B:** There is a positive relationship between paying the partner based on its performance and radical innovation.

**Hypothesis 2C:** The positive effect of pay-for-performance is stronger for radical than for incremental innovation.

### 4.2.4. Moderation Effect of Risk-Aversion on Incremental and Radical Innovation

AT further suggests that the optimal reward scheme depends on the partner’s (i.e., the agent’s) degree of risk-aversion (Eisenhardt, 1989a; Levinthal, 1988). When the partner is paid based on its performance, rather than the process or resources used, its liability increases (Gates et al., 2004). The partner is confronted with increased responsibilities and bears more risk because its income stream is uncertain (Gates et al., 2004; Gruneberg et al., 2007; Guajardo et al., 2012; Kim et al., 2010; Ng & Nudurupati, 2010). Among these risks are the possibility of defects, the possibility of failure to meet completion deadlines, and financial risk. Since attitudes toward risk differ among organizations, we argue that the level of incremental and radical innovation is lower for a risk-averse partner that is paid for its performance. Previous research has shown that risk-averse organizations sacrifice some of their expected returns to minimize risk (March & Shapira, 1987; Singh, 1986). They will opt for status-maintaining decisions, and they will favor solutions that have been proven to work well over higher-risk options (Ederer & Manso, 2013). Therefore, when a risk-averse
partner’s payment is linked to its performance, the partner may make conservative decisions and establish greater cost control at the expense of creative freedom. This may result in fewer resources being devoted to innovative activities, since both types of innovation are inherently risky (Bloom & Milkovich, 1998; Makri et al., 2006).

Exploiting existing knowledge domains for incremental innovation or exploring new domains for radical innovation can be expensive and involves commitment of the partner’s assets (Das & Joshi, 2007). Moreover, it requires organizations to take risk, as innovation may not always contribute to the targeted performance. This is especially true for radical innovation because it involves a greater risk than incremental innovation does. Thus, we suggest that the partner’s degree of risk-aversion has a stronger negative moderation effect on radical than on incremental innovation. Accordingly, we propose:

**Hypothesis 3A:** There is a negative moderation effect of the partner’s degree of risk-aversion on the relationship between pay-for-performance and incremental innovation.

**Hypothesis 3B:** There is a negative moderation effect of the partner’s degree of risk-aversion on the relationship between pay-for-performance and radical innovation.

**Hypothesis 3C:** The negative moderation effect of the partner’s degree of risk-aversion is stronger for radical than for incremental innovation.

Figure 4.1 summarizes the hypothesized relationships. We first expect an inverse-U relationship between term specificity and incremental innovation, moreover we expect a negative relationship between term specificity and radical innovation. In addition, we hypothesize that paying the partner based on performance positively affects both types of innovation. This effect is theorized to be stronger for radical innovation. Finally, we expect a negative moderation
effect of risk-aversion on the relationship between pay-for-performance and both types of innovation. We posit that this moderation effect is stronger for radical than for incremental innovation.

**Figure 4.1:** Conceptual Model: Relationship between PBC Characteristics and Innovation

4.3. **Research Methods**

4.3.1. **Sample Selection and Data Collection**

The data for this study originated from a survey of buyer-seller relationships in the Dutch maintenance industry. We selected IORs involving a buying and a supplying firm as our unit of analysis, because such IORs are well known for the use of formal governance mechanisms. We chose to gather our data in the maintenance sector because of the importance and frequent use of PBCs in this sector (Hypko et al., 2010). The fact that such contracts are said to positively
affect innovation (Kim et al., 2007; Ng & Nudurupati, 2010) suggests an increased emphasis on innovation in this sector. We also expect the growing use of this type of contract to coincide with more frequent innovation in this sector. Note however, during our interviews with business practitioners and a pilot study we conducted before this study, it was found out that PBCs are not often used in the private sector, and hence we could not collect sufficient data on PBCs. In addition, it was found out that managers sometimes have different definitions of contract types, resulting in e.g., that they say they used a certain contract type which in our definition would be another contract type. As a result, it was not possible to filter out only the PBCs. Nevertheless, given that we are looking at the characteristics of contracts (i.e., term specificity and pay-for-performance) which are present in all contract types with different degrees, it was not necessary to only look at PBCs. We incorporated two other frequently used contract types: fixed-price and cost-plus contracts. For example, term specificity will be lower for a PBC than for a cost-plus contract.

In the context of maintenance, innovation may concern minor changes that lead to a more efficient maintenance process (e.g., a performance dashboard that diagnoses specific problems in advance of the supplier’s site visit) or more major changes that increase the effectiveness of the maintenance process (e.g., changing certain components to reduce the overall maintenance activities).

We collected our data in 2013 from the members of the Dutch Association for Maintenance Services (in Dutch: Nederlandse Vereniging voor Doelmatig Onderhoud, NVDO), using an online survey administered through a dedicated website. We focused on the asset owners (i.e., buyers of maintenance services, total of 430 members) and the providers of maintenance services (i.e.,
total of 430 members) of the total of 1227 NVDO members (thereby excluding consultant members). The asset owners and maintenance providers operate in one of six different maintenance sectors (i.e., real estate, infrastructure, fleet (excluding passenger cars), process industry, manufacturing, and food, beverage, & pharmaceuticals). Given our focus on the use of formal governance in IORs, we surveyed the (430+430) 860 asset owners and providers of maintenance services, because both are knowledgeable about the contract underlying the IOR. We focused on both sides of the IOR as there is a need to survey both parties rather than collecting either the buyer’s or the supplier’s perspective. This will result in a better understanding of the phenomenon we are studying. We pooled the data for the buyers and sellers because there is no theory to suggest that the effects of governance differ on the two sides of the IOR (Jap & Anderson, 2003). Nevertheless, we did conduct a statistical pooling test to prove this assertion, which will be presented in section 4.4.2.

We contacted the board members of NVDO to obtain their approval and support, and we subsequently presented the research as a joint effort where we would present the results of the survey during the association’s yearly conference, with the goal of maximizing the response rate. A letter announcing the survey and when it would be distributed was sent out to all members. We sent the questionnaire accompanied by an introductory letter explaining the intent of the study, assuring confidentiality, and indicating the preferred survey respondent (i.e., a manager knowledgeable about the content of the contract and the collaboration).

The respondents were asked to fill out the questionnaire for a specific service contract with which they had considerable experience. This contract could be any of the three types mentioned: fixed-price, cost-plus, or PBC (Kim et al., 2007). In line with Luo (2002), we interviewed and pre-tested the survey with eight practitioners (who were excluded from the population from which we drew our sample) and management researchers to verify whether the wording
was appropriate for business practitioners and to identify ambiguities in the terms and concepts or other issues. We made minor changes to the wording based on the feedback received. In addition, as suggested by Van Teijlingen and Hundley (2002), we conducted a pilot study with seventy-four buying organizations in different industries who are members of the Dutch Association for Purchasing Professionals (NEVI). We evaluated the feasibility, the time taken, and any adverse events so that we could improve the study design prior to the actual data collection. We also used the pilot study to evaluate and validate the items that we used to measure our variables.

The members of NVDO were reminded three times to respond to our survey; we called the members who had not responded after the third reminder. Eventually, 169 questionnaires were received from asset owners and service providers, for an overall response rate of (169/860=) 19.7%, which compares favorably with existing questionnaire-based research in business and management (Huang et al., 2014; Im & Rai, 2008; Koberg et al., 2003). Of the 169 responses, 63 were discarded due to excessive missing information, resulting in a final usable dataset of 106 responses (i.e., 106 IORs). Note that these responses are non-dyadic data. Of the responding firms, 39.6% are active in the process industry, 19.8% in real estate, 13.2% in food, beverage, & pharmaceuticals, 11.3% in infrastructure, 8.5% in manufacturing, and 5.7% in the fleet sector. The most common roles the respondents hold are contract manager (13.2%), director/owner (13.2%), advisor (12.3%), general manager (12.3%), maintenance manager (6.6%), operations/production manager (6.6%). Furthermore, in 2012 around 59% of the organizations in the sample had more than 250 employees, and the average revenue of the organizations was around €1,273 million (SD=4567). On average, the respondents have 14 (SD=8.4) years of experience in managing relationships with external partners, and they managed 18 (SD=17) contracts in 2012. These figures suggest that the
informants have a high level of competence, which indicates that the responses should be of sufficient quality.

To assess the potential respondent bias, we compared the early and late responses based on the assumption that the opinions of late respondents are representative of the responses of non-respondents (Armstrong & Overton, 1977). The final sample includes 32.1% of the responses in the first wave and 67.9% in the second wave after the first reminder. We compared characteristics such as the sector in which the respondent is active, the function of the respondent, the number of employees, and the number of contracts the respondent managed in 2012. We also compared the responses to all our independent and dependent variables. The results of the independent-sample T-tests showed no significant differences between these groups (p-values ≥ 0.05), suggesting that non-response bias is not a serious threat. In addition, the main reason for not completing the survey given by the non-respondents during the call-back sessions was lack of time. This also suggests that there are no differences between respondents and non-respondents.

4.3.2. Measures
We operationalized the variables using single- or multi-item reflective measures. Where possible, we relied on scales used in previous research. Since we collected our data in the maintenance sector, the survey questions are in the context of service transactions. The items were measured using either five-point or seven-point Likert scales ranging from 1 (strongly disagree) to 5 or 7 (strongly agree). See Appendix D for the items we used for our key variables.

Radical and incremental innovation. Innovation is a proactive undertaking that results in new or improved products/services and new or improved ways of delivering the service. We measure both service and product innovation. Product innovation in a service context entails innovation in the physical goods involved in the use of the service (e.g., innovation in the
machine/asset that is being maintained by the service provider). Incremental innovation was measured using a four-item, five-point Likert scale based on the work of authors who have studied such innovation (Jansen et al., 2006). These items were rewritten for the context of the maintenance industry by other researchers in their study on the use of PBCs in the maintenance sector (Verbeeten, 2014). The items focus on minor changes in existing services and products such as improvements to the efficiency of the maintenance process. Radical innovation was measured using a seven-item, five-point Likert scale. The items for this construct were based on the work of Gallouj and Weinstein (1997) and Hertog (2000) and focus, amongst others, on the extent to which the maintenance provider has developed a new service and product/technology and/or a new way of interacting with the client.

**Term specificity.** Term specificity is the extent to which the contractual clauses prescribe how the partner should deliver the service or which resources it should use. TCE researchers have not operationalized term specificity (which is an element of contractual completeness) since their focus was mainly on the effects of transaction characteristics on the make or buy decision. We therefore had to rely on the small amount of research that is available on the effects of contracts to find a valid and reliable measure for term specificity. Based on (Argyres et al., 2007; Mayer, 2006; Ryall & Sampson, 2009), we captured term specificity in a three-item, seven-point Likert scale which e.g., states to what extent the contract prescribes how the partner should develop certain technologies and which specific resources should be contributed to the service delivery.

**Pay-for-performance.** Pay for performance, which is considered an incentive mechanism in AT, was measured using a six-item, seven-point Likert scale that measures how the partner is rewarded. Specifically, we asked the respondents to what extent the partner is paid based on performance. Examples are the extent to which the provider’s rewards are linked to the outcome of the
service and the extent to which the provider has sufficient financial incentives to improve the service. The items were adapted from Jaworski et al., (1993) which are primarily based on agency and management control theories.

**Risk-aversion of the partner.** Risk-aversion is the degree to which the partner is reluctant to take risks. We opted for a single-item measure of this for three reasons. First, even though risk-aversion is a very important variable in AT, it has received little attention in research, especially in IOR literature. As a result, high-quality, validated reflective measures of organizational risk-aversion in an IOR context are virtually nonexistent. Second, the measures developed by Venkatraman (1989) demonstrated weak validity in our pilot study. Third, single-item risk-preference measures have worked well in existing economics and management research (Dohmen et al., 2011; Pennings & Garcia, 2001). Our final measure captured, on a seven-point Likert scale, the degree to which the partner prefers to follow “tried and true” paths. The higher the score, the more risk-averse the partner.

**Control variables.** To control for potentially confounding factors, we used several control variables. First, firm size can influence both types of innovation because firms of different sizes exhibit different organizational characteristics and resource deployment (Wang et al., 2011). Large firms may have slack resources that might positively affect innovation (Liu, Li, & Wei, 2009). Firm size (of the buyer and provider) was measured via the number of employees in the organization.

Second, trust is viewed as an important mechanism to stimulate incremental and radical innovation (Dovey, 2009; Nielsen & Nielsen, 2009; Wang et al., 2011). To illustrate, the interaction among parties who trust each other will be more informal, leading to the creation and sharing of existing and/or new knowledge that could result in innovation (Im & Rai, 2008; Wang et al., 2011). Based on validated items used in previous research, we measured trust using a nine-item, five-point Likert scale that captures goodwill, and
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competence trust (Aulakh, Kotabe, & Sahay, 1996; Green, 2003; Lui & Ngo, 2004). Competence trust focuses on whether the parties are able to fulfill an agreed-upon obligation. In contrast, goodwill trust refers to the trust one has in the partner’s intention to fulfill its role in the collaboration (Das & Teng, 2001; Lui & Ngo, 2004; Nooteboom, 1996).

Third, we controlled for relationship length because enduring relationships may help parties build trust (Kramer, 1999; Malhotra & Lumineau, 2011), which may, in turn, affect innovation (Wang et al., 2011). The relationship length was measured as the number of years since the relationship formation. The average relationship length was 12 years (SD = 9) in our sample.

Fourth, since prior research has shown that the industry in which the firm operates and the complexity of the transaction may affect incremental and radical innovation (Damanpour, 1991; de Brentani, 2001), we controlled for these factors as well. The transaction complexity was measured using a single-item, five-point Likert scale asking respondents about the complexity of the products and services in the selected contract. In addition, we created dummy variables for the six maintenance sectors to control for industry effects. Finally, we controlled for perception differences between buyers and suppliers by controlling for the type of organization the respondent represents (i.e., asset owner or provider of the maintenance service).

4.4. Results

To estimate the measurement and structural models, we opted for partial least squares (PLS), which has been widely adopted in business research (Johnston et al., 2004; Peng & Lai, 2012; Rosenzweig, 2009). PLS is a confirmatory multivariate analysis technique that allows for investigating latent and observable variables at the same time (Johnston et al., 2004). The difference with other structural equation modelling techniques is that PLS draws
conclusions about the strength of the individual relationships between variables through path coefficients to conclude whether relationships are statistically significant rather than the overall fit of a proposed model to observed covariances amongst the variables (Johnston et al., 2004). Nevertheless, rather than relying on a goodness-of-fit test, PLS relies on predictive validity (Q2) and explained variance ($R^2$) to assess the model’s validity. Despite the increasing interest in using PLS (Hair, 2010), researchers have questioned the usefulness of PLS over other techniques (Ronkko & Evermann, 2013). We acknowledge these critiques and address them by e.g., having a sufficient sample size (for PLS) and conducting extra robustness checks of our results.

We chose PLS for several reasons. First, compared to covariance-based structural equation modeling (CBSEM), PLS is a more appropriate tool for analyzing hypotheses at an early stage of model development (Peng & Lai, 2012), making it particularly useful for our model as we are one of the first to test the effects of contractual characteristics on innovation. PLS can help in refining theory by showing which assumed predictors are substantively related to outcomes (Johnston et al., 2004). It can test relationships where there are interrelated antecedent conditions; each measured through multiple-items and connected through various paths which is in contrast to traditional regression analysis of testing the reliability of multi-item measures prior to using them in a structural model (Johnston et al., 2004). Second, our research model is complex, due to the inverse-U and moderation effect in a single model, with two dependent variables. In the presence of model complexity, CBSEM increases the total number of parameter estimates, possibly leading to model identification and convergence issues (Peng & Lai, 2012). Model complexity may even increase the required sample size in CBSEM since, e.g., for a moderation effect a new construct is computed by multiplying the items of each construct. PLS, on the other hand, uses an iterative algorithm to separately calculate parts of the measurement model, and it subsequently estimates the structural path
coefficients (Peng & Lai, 2012). This leads to a successful estimate of the factor loadings and structural paths subset by subset (Peng & Lai, 2012). PLS thus readily accommodates complex relationships in the structural model, and it does so effectively with a relatively small sample size (Hair, 2010; Im & Rai, 2008; Pulles et al., 2014; Rosenzweig, 2009).

We first used expectation maximization (EM) to replace a small number of missing values (Tsikriktsis, 2005). We then used a bootstrapping sample of 500 and ran 300 cases per resampling to estimate the standard errors and statistical significance of the structural paths. A large bootstrapping sample (of 500 or more) is recommended because it reduces the effect of random sampling error (Peng & Lai, 2012). As a recommended standard practice (Ahuja, Galletta, & Carley, 2003), we replicated the analyses with two additional iterations (bootstrapping samples of 200 and 1000) to assess the stability of the significance of the path coefficients. The results are consistent across the three bootstrap samples.

4.4.1 Measurement Model

We employed confirmatory factor analysis (CFA) to assess the unidimensionality, convergent validity, and discriminant validity of our multi-item constructs. In line with previous research, we followed Gefen and Straub’s (2005) guidelines to validate our reflective measures by using standard factorial validity for PLS (Im & Rai, 2008). Table 4.1 presents the descriptive statistics and the bivariate correlations among the variables. All the indicators load high (>0.5) on their respective constructs and are significant at a 1% significance level, providing evidence for unidimensionality and convergent validity. The composite reliabilities (CRs) exceed the 0.70 threshold for acceptable reliability (Bagozzi & Yi, 1988). The average variance extracted (AVE) values exceed the 0.50 threshold for all constructs and the Cronbach’s alpha range between .68
**Table 4.1: Descriptive Statistics and Correlation Matrix**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
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<th>13</th>
<th>14</th>
<th>15</th>
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<tr>
<td>1. Radical innovation</td>
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<td>2. Incremental innovation</td>
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<td>.88</td>
<td>.497**</td>
<td>1</td>
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<tr>
<td>3. Specificity level</td>
<td>3.43</td>
<td>1.53</td>
<td>.239*</td>
<td>.489**</td>
<td>1</td>
<td></td>
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<tr>
<td>4. Pay-for-performance</td>
<td>3.67</td>
<td>1.45</td>
<td>.368**</td>
<td>.190</td>
<td>.349**</td>
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<td>5. Risk-Aversion</td>
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<td>-.184</td>
<td>-.023</td>
<td>.062</td>
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<tr>
<td>6. Transactional complexity</td>
<td>3.50</td>
<td>.89</td>
<td>.149</td>
<td>.205*</td>
<td>.249**</td>
<td>.209*</td>
<td>-.019</td>
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<td>7. Trust</td>
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<td>.152</td>
<td>.319*</td>
<td>.320**</td>
<td>.013</td>
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<td>8. Relationship length</td>
<td>11.49</td>
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<td>-.020</td>
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<td>9. Firm size</td>
<td>5.91</td>
<td>2.39</td>
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<td>-.199*</td>
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<td>.077</td>
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<tr>
<td>10. Industry: Infrastructure</td>
<td>.11</td>
<td>.32</td>
<td>.020</td>
<td>.052</td>
<td>-.105</td>
<td>-.099</td>
<td>-.014</td>
<td>.000</td>
<td>-.134</td>
<td>-.113</td>
<td>.152</td>
<td>1</td>
<td></td>
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<td>11. Industry: Fleet</td>
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<td>.114</td>
<td>.115</td>
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<td>12. Industry: Process</td>
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<td>.059</td>
<td>.135</td>
<td>.184</td>
<td>.002</td>
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<td>-.198*</td>
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<td>13. Industry: Manufacturing</td>
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<td>-.053</td>
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<td>14. Industry: Food, Beverage, Pharma</td>
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<td>-.180</td>
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<td>-.214*</td>
<td>-.080</td>
<td>-.079</td>
<td>-.031</td>
<td>-.121</td>
<td>-.038</td>
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<td>-.139</td>
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<td>-.316**</td>
<td>-.119</td>
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<td>15. Perspective focal firm/ partner</td>
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<td>.50</td>
<td>.269**</td>
<td>.530**</td>
<td>.278**</td>
<td>-.048</td>
<td>-.154</td>
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</table>

Cronbach’s Alpha

| Mean | S.D. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| -    | -    | .85 | .929 | .683 | .865 | -   | -   | .901 | -   | -   | -   | -   | -   | -   | -   | -   | -   |

Composite Reliability

| Mean | S.D. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| -    | -    | .898 | .943 | .824 | .898 | -   | -   | .918 | -   | -   | -   | -   | -   | -   | -   | -   | -   |

Average Variance Extracted (AVE)

| Mean | S.D. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| -    | -    | .688 | .703 | .611 | .597 | -   | -   | .557 | -   | -   | -   | -   | -   | -   | -   | -   | -   |

N= 106

**Significance level: p < 0.01 (2-tailed)**

*Significance level: p < 0.05 (2-tailed)*
and .93. The discriminant validity was assessed by comparing the AVE with the squared correlation between construct pairs (Fornell & Larcker, 1981). The AVEs exceed the squared correlations between constructs, indicating that each construct explains more within-construct than across-construct variance. In addition, our data does not contain cross-loadings. These results provide evidence of discriminant validity among the theoretical constructs.

To minimize the possibility of common-method bias, we took several preventive measures (Podsakoff et al., 2003). First, the pre-test we conducted before the actual survey minimized the item ambiguity and any comprehension problems for the respondents. Second, we guaranteed respondent anonymity, which reduces respondents’ tendency to provide socially desirable answers (Smets, Langerak, & Rijsdijk, 2013). Finally, we included items that needed to be reverse coded, which is recommended to reduce the potential effects of pattern responses (Hinkin, 1995). To identify whether our preventive measures were effective, we looked at the path coefficients of the models and Harman’s post-hoc one-factor test (Podsakoff et al., 2003). The path coefficients show different levels of significance across the models, indicating the reduced likelihood of common-method bias. In addition, principal component analysis for Harman’s post hoc-one factor test showed that the first factor accounts for only 26.9% of the variance, suggesting that the observed variance cannot be explained by one underlying factor (Im & Rai, 2008). Collectively, these tests indicate that there is a reduced likelihood of common-method bias in our data.

4.4.2. Hypothesis Tests
Because we tested our hypotheses using PLS, we were able to combine all the dependent variables and the independent and control variables into one model. To enhance the interpretability of the outcomes of the hypothesis tests, we mean-centered and standardized the variables term specificity, pay-for-performance, and risk-aversion prior to creating the cross products and
interaction terms. Standardization and mean centering improves the robustness of the analyses without lowering the quality of the data (Rothaermel & Deeds, 2006). Table 4.2 examines the relationship between the contractual characteristics and incremental and radical innovation. We tested the relationships with three separate models, each simultaneously measuring the effects of the independent variables on both dependent variables. Model 1 is the baseline model; it tests only the control variables. Each subsequent model provides an improvement over the baseline model. Model 2 evaluates the impact of the direct effects of the independent variables (including the cross-product variable of term specificity) on the dependent variables. Finally, model 3 includes the effect of the moderation variable on incremental and radical innovation. This model corresponds to the complete model from Figure 4.1 and exhibits adequate predictive power ($R^2$), since it explains 55% of the variance in incremental innovation and 34% in radical innovation. These outcomes compare favorably with the values obtained in other IOR and innovation studies (e.g., Im & Rai, 2008; Koberg et al., 2003; Lui & Ngo, 2004; Luo, 2002). As an additional model quality indicator, we also evaluated how well our estimated model reconstructs our empirical data (i.e., predictive relevance) using Stone–Geisser’s $Q^2$ (Geisser, 1975; Stone, 1974) by means of blindfolding in SmartPLS. For the final model, $Q^2$ is greater than zero for incremental and radical innovation, indicating acceptable predictive relevance (Peng & Lai, 2012).

In addition, we checked for multicollinearity problems. The variance inflation factors (VIFs) range from 1.12 to 1.85, diminishing this concern as the VIF levels are below the rule-of-thumb cut-off of 10 (O’Brien, 2007). Finally, to determine whether the data allows for pooling the responses from the buying and selling organizations, a Chow-test was conducted (Lee, 2008). The results show that for both models; incremental innovation and radical innovation, the hypothesis of equality is not rejected and, hence, allows for pooling the data.
## Table 4.2: Results

### Controls

<table>
<thead>
<tr>
<th>Dummy variable industry, baseline category: Real estate sector</th>
<th>Model 1: Impact on</th>
<th>Model 2: Impact on</th>
<th>Model 3: Impact on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size</td>
<td>Incremental innovation</td>
<td>Radical innovation</td>
<td>Incremental innovation</td>
</tr>
<tr>
<td></td>
<td>-0.13*** (0.04)</td>
<td>-0.03 (0.04)</td>
<td>-0.13*** (0.04)</td>
</tr>
<tr>
<td>Trust</td>
<td>0.23*** (0.05)</td>
<td>0.12* (0.06)</td>
<td>0.19*** (0.04)</td>
</tr>
<tr>
<td>Relationship duration</td>
<td>0.01 (0.02)</td>
<td>-0.10* (0.06)</td>
<td>0.05 (0.03)</td>
</tr>
<tr>
<td>Transactional complexity</td>
<td>0.15*** (0.05)</td>
<td>0.13** (0.06)</td>
<td>0.08* (0.04)</td>
</tr>
<tr>
<td>Industry: Infrastructure</td>
<td>0.06 (0.05)</td>
<td>0.00 (0.04)</td>
<td>0.11** (0.05)</td>
</tr>
<tr>
<td>Industry: Fleet</td>
<td>0.04 (0.03)</td>
<td>0.06* (0.03)</td>
<td>-0.01 (0.02)</td>
</tr>
<tr>
<td>Industry: Process</td>
<td>0.05 (0.05)</td>
<td>0.03 (0.05)</td>
<td>0.06 (0.04)</td>
</tr>
<tr>
<td>Industry: Manufacturing</td>
<td>-0.09 (0.07)</td>
<td>-0.07 (0.06)</td>
<td>-0.07 (0.05)</td>
</tr>
<tr>
<td>Industry: Food, Beverage, Pharma</td>
<td>-0.19*** (0.06)</td>
<td>-0.13** (0.07)</td>
<td>-0.14*** (0.05)</td>
</tr>
<tr>
<td>/partner</td>
<td>0.46*** (0.04)</td>
<td>0.24*** (0.05)</td>
<td>0.36*** (0.05)</td>
</tr>
</tbody>
</table>

### Direct effects

<table>
<thead>
<tr>
<th>Dummy variable industry, baseline category: Real estate sector</th>
<th>Model 1: Impact on</th>
<th>Model 2: Impact on</th>
<th>Model 3: Impact on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specificity level</td>
<td>0.23*** (0.06)</td>
<td>-0.06 (0.05)</td>
<td>0.20*** (0.06)</td>
</tr>
<tr>
<td>Specificity level$^2$</td>
<td>-0.10*** (0.05)</td>
<td>0.06 (0.05)</td>
<td>-0.11*** (0.04)</td>
</tr>
<tr>
<td>Pay-for-performance</td>
<td>0.11** (0.05)</td>
<td>0.42*** (0.05)</td>
<td>0.10* (0.04)</td>
</tr>
<tr>
<td>Risk-aversion</td>
<td>-0.13*** (0.04)</td>
<td>-0.08* (0.05)</td>
<td>-0.13*** (0.04)</td>
</tr>
</tbody>
</table>

### Moderation effect

<table>
<thead>
<tr>
<th>Dummy variable industry, baseline category: Real estate sector</th>
<th>Model 1: Impact on</th>
<th>Model 2: Impact on</th>
<th>Model 3: Impact on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay-for-performance x RA</td>
<td>0.13*** (0.08)</td>
<td>0.27*** (0.05)</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

- **PfP:** Pay-for-performance; **RA:** Risk-aversion. Standardized coefficients are shown, with standard errors in parentheses.
- Two-tailed tests. *p < 0.1, **p < 0.05, ***p < 0.01
- Dummy variable industry, baseline category: Real estate sector. Dummy variable perspective: 0 = focal firm, 1 = partner.
Hypothesis 1A states that the relationship between term specificity and incremental innovation is inversely U-shaped. The results obtained in model 3 support Hypothesis 1A since the linear term of term specificity is positive and significant ($\beta=0.20$, $p<0.01$), while the squared term of term specificity is negative and significant ($\beta=-0.11$, $p<0.05$). This means that there is an optimal level of term specificity that maximizes incremental innovation: neither contracts with a (very) high degree of term specificity, nor contracts with a (very) low degree of term specificity are conducive for such innovation. On the other hand, Hypothesis 1B states that the higher the degree of term specificity in a contract, the less likely that the partner will engage in radical innovation. The results show that this hypothesis is supported ($\beta=-0.09$, $p<0.1$).

Hypotheses 2A and 2B state that pay-for-performance has a positive effect on incremental and radical innovation. The results in Table 4.2 show that Hypotheses 2A ($\beta=0.10$, $p<0.1$) and 2B ($\beta=0.38$, $p<0.01$) are supported. The beta coefficient for radical innovation is almost four times larger than for radical innovation. This lends empirical support for hypothesis 2C. This means that pay-for-performance seems to have a stronger effect on radical than on incremental innovation.

Hypotheses 3A and B states that the partner’s degree of risk-aversion negatively moderates the relationship between pay-for-performance and incremental and radical innovation. For accurate results, we also tested the direct effect of the moderation variable on the dependent variables. As shown in Table 4.2, hypothesis 3A is not supported; there is a significant positive moderation effect of risk-aversion on the relationship between pay-for-performance and incremental innovation ($\beta=0.13$, $p<0.01$), meaning that pay-for-performance has a stronger positive effect on incremental innovation when the partner is risk-

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27 The tipping point of the inverse-U relationship between term specificity and incremental innovation is within the observed variable range (i.e., 4.82). The tipping point is calculated by using the formula $X=\frac{-b}{2a}$, this output should be multiplied by term specificity’s standard deviation and subsequently be added to its mean.
averse. To better understand the form of the moderation effect, Figure 4.2A plots the relationship between pay-for-performance and incremental innovation for low (one SD below the mean) and high (one SD above the mean) values of the partner’s degree of risk-averseness. Consistent with the positive interaction term, the plot shows a positive relationship between pay-for-performance and incremental innovation when the partner’s degree of risk-averseness is high. Moreover, this figure reveals that for providers who are less risk-averse, the slope is negative. The simple slope test (Aiken & West, 1991) shows that the positive relationship between pay-for-performance and incremental innovation is significant when the partner’s degree of risk-averseness is high ($\beta=0.33$, $p<0.05$).

**Figure 4.2A:** Plot of the Moderating Effect of Risk-Aversion on Incremental Innovation
Table 4.2 further shows that there is a positive moderation effect of risk-aversion on the relationship between pay-for-performance and radical innovation, thus leading us to not support hypothesis 3B. The interaction term is positive and significant ($\beta=0.27, p<0.01$), meaning that the relationship between pay-for-performance and radical innovation is stronger when the partner has a high degree of risk-aversion. Consistent with the positive interaction term, the plot in Figure 4.2B shows that there is a positive effect of pay-for-performance on radical innovation for providers with a high degree of risk-aversion. Testing the simple slopes shows that the positive relationship between pay-for-performance and radical innovation is significant when the partner’s degree of risk-averseness is high ($\beta=0.46, p<0.01$).

**Figure 4.2B:** Plot of the Moderating Effect of Risk-Aversion on Radical Innovation
Finally, the beta coefficient of the moderation effect of radical innovation is more than two times higher than for incremental innovation. This suggests a stronger moderation effect for radical innovation, but this effect is positive. Hence, hypothesis 3C is also not supported.

Table 4.3 summarizes the findings of the hypothesis tests. The theoretical and practical implications are discussed in the next section.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>Supported</td>
</tr>
<tr>
<td>H1b</td>
<td>Supported</td>
</tr>
<tr>
<td>H2a</td>
<td>Supported</td>
</tr>
<tr>
<td>H2b</td>
<td>Supported</td>
</tr>
<tr>
<td>H2c</td>
<td>Supported</td>
</tr>
<tr>
<td>H3a</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3b</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3c</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>
4.5. Discussion and Conclusion

Existing research into the performance implications of (incomplete) contracts is limited and has mostly focused on the negative effects of relationship outcomes. Our empirical investigation of PBCs, which we argue are specific examples of incomplete contracts, has innovation as a positive relationship outcome. PBCs emphasize the performance that the partner must achieve. We focus on two characteristics of PBCs: low term specificity and linking the partner’s rewards to performance. The former was derived from TCE, which argues that contractual detail is a suitable safeguard against opportunism in IORs. The latter was derived from AT, which suggests that rewarding a partner for its performance will safeguard the IOR from opportunism. We empirically investigated the effect of these two characteristics on incremental and radical innovation.

For the most part, our results support the theoretical relationships that we posited. First, we found that term specificity affects incremental and radical innovation differently. Term specificity is inverse-U related to incremental innovation, meaning that if the term specificity is too high or too low it will not lead to the highest possible level of such innovations. This observation reinforces existing findings in within-firm settings that indicate that a certain degree of term specificity leads to incremental improvements in processes and outputs (Benner & Tushman, 2003; Daft & Lengel, 1986; Jansen et al., 2006). Capturing a certain degree of rules and obligations in contracts make existing knowledge and skills explicit, enabling more efficient exploitation and faster implementation of incremental changes (Jansen et al., 2006). However, this effect was not found for radical innovation. We instead found that term specificity negatively affects radical innovation. This is in contrast with several existing studies in intra-firm settings, which suggest that rules and obligations are not detrimental to radical innovation. Based on our findings, we argue that in an inter-organizational setting, a higher degree of term specificity, and thus less autonomy, produces inertial forces and makes the partner focus on incremental
improvements rather than on radical innovation. Hence, term specificity seems to have different effects on the two types of innovation.

Second, in line with our theoretical model, we found that pay-for-performance positively affects both incremental and radical innovation, with a stronger effect on the latter. Third, we found that the partner’s degree of risk-aversion positively rather than negatively moderates the relationship between pay-for-performance and incremental and radical innovation. This means that under pay-for-performance conditions, risk-averse partners will engage more strongly in incremental and radical innovation. This is in contrast to our expectations that risk-aversion would have a negative moderation effect. A plausible explanation for this finding is the pressure that the partner experiences. Risk-averse partners are generally less likely to accept contracts with outcome-based compensation because of the uncertain income stream. Since “outcomes are only partly a function of behaviors” (Eisenhardt, 1989, p. 61), other factors that influence outcomes (e.g., external contingencies such as macroeconomic conditions and “force majeure”) may be outside the partner’s control. Risk-averse partners will emphasize these possible external influences more than their own influence on the outcome, and they will possibly even seek to avoid pay-for-performance schemes (unless they get an appropriate risk-premium). However, in some situations, the partner may be forced to accept such reward schemes, for example because the focal organization is an important customer or the focal firm has more power and can force the supplier to accept such reward schemes. Under such conditions, risk-averse partners will experience pressure to succeed, because the consequences of not meeting performance targets could have serious financial consequences. Such pressure drives organizations to place a greater value on creative ideas and, thus, to act on the outcomes of a creative climate (Hunter, Bedell, & Mumford, 2007; Janssen, Vliert, & West, 2004). Similarly, pressure that arises as a result of, for example, intellectually challenging situations or workload has been shown to positively affect creativity
and innovation (Amabile & Gryskiewicz, 1987; Amabile, 1988; Bunce & West, 1994). Such pressure may elicit creative thinking and persistence in deriving solutions (e.g., Anderson, De Dreu, & Nijstad, 2004; Nicol & Long, 1996) that lead to the desired performance. Although the consequences of not meeting performance targets may be equally severe for both risk-averse and non risk-averse partners, the latter will experience less pressure since they are more familiar with such situations and more open to taking risks. We also found that the moderation effect is stronger for radical than for incremental innovation. This can potentially be explained by the fact that radical innovation usually involves higher pressure to perform than incremental innovation. The pressure increases as the result of higher uncertainty and a higher probability of failure inherent to radical innovation.

Our study makes a number of theoretical contributions. First, it adds to the limited stream of research on the (positive) performance implications of (performance-based) contracts (Anderson & Dekker, 2005; Hypko et al., 2010; Schepker et al., 2014), specifically innovation performance. Our findings provide evidence for the assertion that the antecedents have different effects on incremental and radical innovation. Incremental innovation requires a higher degree of term specificity than radical innovation, which benefits more from a contract that is free of rules and obligations. The opportunism that might arise from a term specificity that is too low should be offset by linking rewards to performance, but this is less urgent for incremental innovation. This inter-relationship between term specificity and pay-for-performance underlines the importance of using both TCE and AT to explain the effects of (performance-based) contracts, in contrast to existing research, which uses the theories separately. This also explains why our focus on PBCs is appropriate: their characteristics (i.e., low term specificity and rewards being linked to performance) allow for the interdependent application of both solutions. Another important research contribution is our finding that the use of incomplete
contracts should not be limited to IORs involving non risk-averse partners only. Rather, our findings suggest that contracts based on pay-for-performance may be more successful when the partner is risk-averse. The increased pressure resulting from the pay-for-performance clause inherent in PBCs may positively affect the risk-averse partner’s creativity and persistence. These positive effects of pressure are stronger for risk-averse than for non risk-averse partners, because the latter have more experience with risky situations.

Our results have several implications for practitioners. First, the finding that the relationship between term specificity and incremental innovation appears to have an optimum suggests an interesting tension. The partner needs the freedom to decide how to deliver the service and which resources to use, but when the term specificity is too low or too high, it may have detrimental effects on incremental innovation. Finding the optimal degree of term specificity requires significant managerial skills. Managers must understand the risks associated with giving the partner too much freedom and the limitations imposed by an overly detailed contract. The resulting level of term specificity may however not be low enough to give an optimal level of radical innovation.

For radical innovation, organizations must think carefully about incentivizing the partner via pay-for-performance. Paying the partner based on their performance will also lead the partner to engage in incremental innovation, but to a lesser extent than radical innovation. Finally, when pursuing innovation, organizations should preferably engage in outcome-based reward schemes with risk-averse partners, since under conditions of pay-for-performance, risk-averse partners tend to achieve higher levels of incremental and radical innovation. To summarize, for incremental innovation, organizations should design a contract with an optimal degree of term specificity and may then add pay-for-performance schemes. For radical innovation, pay-for-performance schemes are critical to counter the opportunism resulting from the lack of constraints (i.e., the low level of term specificity) needed for this type of innovation. Since PBCs
CHAPTER 4

have both characteristics, they may be effectively used for both types of innovation, although not simultaneously. Organizations need to think about the type of innovation they wish to pursue, to determine the appropriate level of term specificity, and to consequently develop appropriate pay-for-performance schemes.

4.5.1. Limitations and Future Research

Our study has several limitations. First, we used perceptual data only; future research could use objective data such as the actual content of the contracts. An in-depth contractual analysis would fit with the call for more research based on contractual content (Chen & Bharadwaj, 2009; Faems et al., 2008). Second, although we did not find response bias in our data, the response rate is rather low. As has been observed before (Im & Rai, 2008), despite the association’s support of this research, it was difficult to increase the response rate. We therefore suggest that a larger sample should be studied in future research to increase the external validity. Moreover, our sample is drawn from firms in the Dutch maintenance sector and therefore can be generalized only to this population. Future research should seek to extend this domain to other industries and geographical areas. More generally, additional research on the relationship between contracts and innovation is required, particularly in conjunction with contingency variables such as the partner’s characteristics or the external environment (e.g., market uncertainty) and the internal environment (climate for innovation) (Das & Joshi, 2007; Wang et al., 2011). In addition, even though both types of innovation may occur in the maintenance industry, as can be observed in our data, it may be biased towards more incremental innovation as radical innovation occurs less often in these industries. A statistical test indeed showed that incremental innovation is significantly higher than radical innovation in our sample ($P=0.0445$). We, therefore, focus on this type of innovation in the next chapter. Nevertheless, we do show the results of radical
innovation in an appendix. Finally, since common-method bias cannot be completely eliminated in single-respondent studies, caution must be exercised in interpreting the results. This bias may make the results of the hypothesized relationships stronger or weaker (Das & Joshi, 2007; Parkhe, 1993). Therefore, future research should preferably be based on mixed-method and multi-respondent approaches.

There are several interesting avenues for future research. First, in contrast to recent studies in intra-firm settings, which found that contractual detail might not be as detrimental for radical innovation as previously thought, we have found that term specificity does have a negative effect on radical innovation. Future work could continue this line of research by studying whether contractual term specificity affects radical innovation differently in inter- versus intra-firm settings. Second, future studies could investigate the effects of different pay-for-performance schemes, such as bonuses and innovation incentives, on innovation. In an intra-firm setting, reward schemes, such as stock ownership and stock options, have been shown to affect either short-term goals (incremental innovation) or long-term goals (radical innovation) (Sanders, 2001); similar studies could be conducted in an inter-firm setting. Third, future research could focus on the conditions under which risk-aversion is an advantage rather than a disadvantage. Existing research has shown that pressure may foster creativity when it arises from intellectually challenging situations; but other types of pressure (e.g., stress resulting from time pressure) may have the opposite effect. It seems worthwhile to study how organizations can create and maintain “healthy” pressure for their risk-averse partners. Finally, we tested the effect of formal control on innovation; we did not address the effects of relational governance. IORs governed by contracts that are prone to opportunistic behavior require other governance methods such as the relationship. By keeping the contract open, organizations demonstrate that they trust their partners to deliver the service as agreed. Relational aspects such
as trust, communication, and commitment therefore become important (Mohr & Spekman, 1994; Schmoltzi & Wallenburg, 2012). These relational attributes could also affect innovation. Future research could therefore study the interaction between (performance-based) contracts and relational governance elements, rather than testing their effects independently in separate studies. In the following chapter, we will include relational governance in our study.
CHAPTER 5

How Contracts and Trust are Both Necessary for Innovation in Inter-Organizational Relationships

In the previous studies, it is deliberately decided to solely focus on contracts to fully understand its effects on outcomes so that it can subsequently be placed in a broader context by including informal governance as well.

Rather than investigating how on average contracts and trust affect innovation, this study uses the Necessary Condition Analysis to identify whether and which combinations of contracts and trust are necessary conditions for a desired level of innovation (which cannot be identified by using regular regression analyses). In this study, contracts in general are studied rather than focusing on a specific type of contract. By taking a broader perspective, the necessary conditions related to formal and relational governance can be identified to make the results applicable to all contract types.

This study uses survey data on 48 IORs in the Dutch maintenance industry which is a subset of the data used in study 3. It was decided not to take the full set of the data because the NCA method cannot control for confounding factors. Hence, it was important to create a homogeneous dataset, which resulted in using only a subset of the data. In addition to this, given that incremental innovation occurs more often in the maintenance industry, we have decided to show the results of this type of innovation only (nevertheless, the results of radical innovation are presented in an appendix and discussed in section 6.2.2) due to the complexity of introducing a new analysis method (i.e., NCA).

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28 This research was conducted in collaboration with Van der Valk, W. (1st author), Dul, J (3rd author), Schroeder, R (4th author). An earlier version of this chapter was presented at the 2014 IPSERA (South-Africa) conference. An adapted version of this chapter is under review for publication in an operations management journal.

29 The principal researcher of this dissertation (who is the second author of this paper) was responsible for the research question, literature search (partly), theory development (partly), and data collection. Dul, J. was responsible for the development of the NCA analysis method and for analyzing the data for this paper.
5.1. Introduction

Organizations rely on two important governance mechanisms, contracts and trust, to encourage collaboration and reduce opportunistic behavior in interorganizational relationships (IORs) (Lumineau & Malhotra, 2011). Contracts, as a form of formal governance, and trust, as a form of relational governance, have been connected to various relational outcomes, such as financial and relationship performance and the willingness to continue the collaboration (Luo, 2002; Malhotra & Lumineau, 2011; Poppo & Zenger, 2002). The number of studies in this area suggests that these governance mechanisms are considered important for inter-firm collaboration and value creation (Malhotra & Lumineau, 2011; Wang et al., 2011). However, despite the considerable research, there is little consensus on the combined effect of trust and contracts on relational outcomes.

Some researchers view contracts and trust as substitutes (Dyer & Singh, 1998; Gulati et al., 2005): trust or contracts produce the desired outcome. This view suggests that formal rules undermine the operation of social norms supporting informal dealings (Gulati & Nickerson, 2008). In contrast, the complementarity view suggests that the joint use of formal and informal arrangements provides more efficient outcomes than the use of either arrangement in isolation (Gulati & Nickerson, 2008): trust and contracts jointly produce the desired outcome. Various authors have provided support for the complementary roles of contracts and trust (Fryxell et al., 2002; Luo, 2002; Poppo & Zenger, 2002).

To take advantage of their differential impacts (Lindrvidst, 1996), effective IOR governance structures draw on a combination of contractual and relational aspects (Mahapatra et al., 2010). This notion has two implications. First, the two governance modes should preferably be considered in combination. Lumineau and Henderson (2012) for example studied the combined effects of relational experience and contractual governance (i.e., control and coordination) on negotiation strategy in buyer-supplier disputes.
Second, the fact that effective IORs draw on both contracts and trust suggest that both may be necessary for achieving innovation. To date however, contracts and trust have not been viewed in terms of necessity. Nevertheless, various authors do hint at the critical nature of these concepts. Malhotra and Lumineau (2011) for example suggest that trust is critical for inter-firm collaboration and value creation. Lazzarini et al., (2004) argue that under low probability of continued exchange, contracts become critical for cooperation.

The present research therefore addresses the question whether both contracts and trust are necessary but not sufficient conditions for innovation. Innovation is selected as the outcome of interest, as it is a fundamental (Adams et al., 2006; Faems et al., 2005) yet under-researched (Wang et al., 2011) element of the value-creating potential of IORs. Innovation in this research is defined as partner\textsuperscript{30}-initiated, proactive undertakings that result in new or improved products/services and new or improved ways of delivering the service (Johnson & Medcof, 2007; Wang et al., 2011). The key component of this definition is that the focal firm (e.g., a buyer) taps into the partner’s (e.g., a supplier) entrepreneurial ideas. The innovation conducted by the partner may be beneficial for both parties: for example, when innovation results in a better service or product for the focal organization and in more efficient delivery of the transaction for the partner. It is important to note that innovative activities are employed as part of daily operations and are not a performance objective per se: contracted activities or performance (e.g., delivery, quality) may or may not be accompanied by innovations. This as opposed to innovation contracts (Beneito, 2006; Gilson et al., 2009), where innovation is the sole performance outcome. In this research, formal governance is interpreted as contractual detail, i.e., the extent to which obligations and behaviors (i.e., term specificity) and

\textsuperscript{30} An IOR can take many forms, such as joint ventures, joint production, contracted R&D, and a long term buyer-seller relationship. In this paper, we address our research question from an intra-IOR perspective. Thus: ‘focal firm’ refers to an organization within the IOR (e.g., a buyer), and ‘partner’ refers to the partner of that focal firm (e.g., a seller). Finally, ‘parties’ refers to the two organizations that are part of the IOR (e.g., the buyer and the seller that form the IOR).
unanticipated contingencies including relevant guidelines for handling these contingencies (i.e., contingency adaptability) are delineated in a contract (Luo, 2002). Relational governance is interpreted as mutual trust; in line with existing research, we make a distinction between goodwill trust and competence trust (Das & Teng, 1998; Malhotra & Lumineau, 2011).

More specifically, this research aims to identify the combinations (levels) of contractual detail, goodwill trust and competence trust that are necessary for innovation. We define “critical” as the logical meaning of “necessary” and view contracts and trust as factors that enable innovation, rather than those that predict innovation. These critical factors are necessary but not automatically sufficient for innovation to occur. Absence of the critical factors guarantees failure that cannot be compensated for by another factor. Recommendations will be focused on exactly these absent factors; any other efforts aimed at achieving innovation will be useless unless the absent factors are in place; no matter the degrees to which other factors are present.

The appropriate methodology for investigating combinations of critical factors is necessary condition analysis (NCA) (Dul et al., 2010). NCA enables us to study not only whether a single antecedent is necessary for innovation (bivariate approach) but also whether and which combinations of antecedents are necessary (multivariate approach) (Dul, 2014). This advances the traditional complement/substitute debate because it provides a new understanding of the combined roles of these two governance modes in achieving innovation. The enhanced understanding allows for strong managerial recommendations: “innovation will not occur at the desired level unless managers put in place the identified necessary conditions.” Our analysis can thus provide practical insights since necessary-condition statements are important in practice, especially in the

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31 In the contracting literature, contractual detail and contractual completeness are used interchangeably. Since we seek to develop a continuous necessary-condition hypothesis, the independent variable should preferably have different levels, rather than simply being present or absent. For this reason, we favor the term contractual detail over contractual completeness in this chapter.
managerial field (Dul et al., 2010). Moreover, evidence of necessity for all three conditions would suggest that for the associated range of the dependent variable, contracts and trust are complements rather than substitutes.

Our study thus makes a substantive and a methodological contribution. Substantively, our study is one of the few empirical studies relating the combination of formal and relational governance mechanisms to innovation as a performance outcome. Furthermore, we add to a limited number of more nuanced studies into the interplay between the two forms of governance (Mahapatra et al., 2010; Sols et al., 2007). By investigating the criticality of contracts and trust, this study furthermore contributes to the large body of research on inter-organizational governance, which has mostly been built on regression-based research identifying predicting rather than enabling factors. We use data on forty-eight buyer-supplier relationships from the Dutch maintenance industry from the perspective of the buying organization to investigate the hypothesized relationships between contracts and trust on the one hand and innovation on the other hand. A methodological contribution is the use of NCA (Dul et al., 2010) to analyze our data as a way to respond to the call for developing a systematic way of testing continuous necessary condition hypotheses (Van der Valk & Wynstra, 2012).

The remainder of this chapter is organized as follows. After briefly reviewing extant literature on formal and/or relational governance in relation to performance, we elaborate on the logic of NCA. We then develop hypotheses, describe our research methods and discuss our results. The chapter ends with a conclusion and discussion, and outlines limitations and future research opportunities.

32 This study uses a subset of the data used in study 3 which we will elaborate on in the ‘research methods’ section of this chapter.
5.2. Theoretical Background

Inter-firm governance is critical for the stability of IORs (Benton and Maloni, 2005; Carr and Pearson, 1999) and concerns the formal and informal rules of exchange, actions and mechanisms by which parties in an IOR (Griffith & Myers, 2005; Vandaele et al., 2007), such as the buyer-supplier relationship, behave. In general, two governance strategies have been studied: formal governance strategies such as contracts, and relational strategies such as trust (Griffith & Myers, 2005). In TCE, contractual governance is a formal, legal, and economic governance strategy defined as the degree to which a formal contract is established (Ferguson et al., 2005; Gardet & Mothe, 2011). Formal contracts are written agreements that are legally binding (Woolthuis et al., 2005). Relational governance as brought forward by social exchange theory (Emerson, 1976; Granovetter, 1985) refers to the relational norms and trust encompassed in IORs (Anderson & Narus, 1990; Heide & John, 1992; Luo, 2007).

Studies of governance and outcomes can be divided into two groups. The first group focuses on formal governance and outcomes or on relational governance and outcomes (the empirical contributions are listed in the first section of Table 5.1; sources listed by publication year). The number of studies addressing formal governance (contracts) is limited because the focus has shifted to relational governance (trust) ever since the importance of relationships in inter-organizational collaboration was first acknowledged (Sharma & Pillai, 2003; Vandaele, 2007). Contracts have been found to positively affect wholesale-distributor performance (Lusch & Brown, 1996), service-exchange performance (Ferguson et al., 2005), and alliance performance (Hoetker & Mellewigt, 2009). Trust has been found to positively affect IOR performance (Johnston et al., 2004; Lavie et al., 2012; Saxton, 1997; Zaheer et al., 1998).
## Table 5.1: Overview of Literature on effects of Contractual and Relational Governance on Performance and Innovation

<table>
<thead>
<tr>
<th>Empirical Study</th>
<th>Research Design, Sample, Response rate, Respondent^{a}</th>
<th>Country^b</th>
<th>RG–Perf./Innov.</th>
<th>CG-Perf./Innov.^{c}</th>
<th>CG&amp;RG-Perf./Innov.^{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noordewier et al. (1990)</td>
<td>Survey, 483, 29%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
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<tr>
<td>Mohr and Spekman (1994)</td>
<td>Survey, 557, 25%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paulin et al. (1997)</td>
<td>122 interviews, 61 dyads, B&amp;S</td>
<td>Can</td>
<td>Neg &amp; Pos.*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saxton (1997)</td>
<td>Survey, 286, 34%, AE</td>
<td>8</td>
<td>Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siguaw et al. (1998)</td>
<td>Survey, 2254, 36.9%, B&amp;S</td>
<td>USA</td>
<td>Neg &amp; Pos.**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zaheer et al. (1998)</td>
<td>Survey, 1050, 15%, B</td>
<td>USA</td>
<td>Neg &amp; Pos.*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sarkar et al. (2001)</td>
<td>Survey, 561, 12.3%, S</td>
<td>19</td>
<td>Neg&amp;P</td>
<td></td>
<td></td>
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<tr>
<td>Fryxell et al. (2002)</td>
<td>Survey, 129, 32%, JVE</td>
<td>USA</td>
<td>Neg. &amp; Pos.**</td>
<td></td>
<td></td>
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<tr>
<td>Bello et al. (2003)</td>
<td>Survey, 402, 72%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
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<tr>
<td>Zhang et al. (2003)</td>
<td>Survey, 623, 22.6%, S</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
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<tr>
<td>Griffith and Myers (2005)</td>
<td>Survey, 500, 20.4%, B</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
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<tr>
<td>Ferguson et al. (2005)</td>
<td>Structured interviews, 160, B&amp;S</td>
<td>Ger, Can, Fra</td>
<td>Pos.**</td>
<td></td>
<td>Pos.**</td>
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<tr>
<td>Krishnan et al. (2006)</td>
<td>Survey, 700, 18%, AE</td>
<td>Ind</td>
<td>Pos.**</td>
<td></td>
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<tr>
<td>Paulraj et al. (2008)</td>
<td>Survey, 954, 32.2%, B</td>
<td>USA</td>
<td>Pos.**</td>
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</tr>
<tr>
<td>Hoetker and Mellewigt (2009)</td>
<td>Survey, 257, 32%, B&amp;S</td>
<td>Ger</td>
<td>Pos.**</td>
<td></td>
<td>Pos.**</td>
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<tr>
<td>Nielsen and Nielsen (2009)</td>
<td>Survey, 1851, 6.5%, AE</td>
<td>Den</td>
<td>Pos.**</td>
<td></td>
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<tr>
<td>Maurer (2010)</td>
<td>Survey, 870, 25.35%, S</td>
<td>Ger</td>
<td>Pos.**</td>
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<tr>
<td>Lavie et al. (2012)</td>
<td>Survey, 964, 44%, S</td>
<td>USA</td>
<td>Pos.**</td>
<td></td>
<td></td>
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<tr>
<td>Empirical Study</td>
<td>Research Design, Sample, Response rate, Respondent&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Country&lt;sup&gt;b&lt;/sup&gt;</td>
<td>RG–Perf./Innov.&lt;sup&gt;c&lt;/sup&gt;</td>
<td>CG-Perf./Innov.&lt;sup&gt;c&lt;/sup&gt;</td>
<td>CG&amp;RG-Perf./Innov.&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>Cannon et al. (2000)</td>
<td>Survey, 2014, 23%, B USA</td>
<td>Pos.**</td>
<td>Neg. &amp; Pos.*</td>
<td>(C) *</td>
<td></td>
</tr>
<tr>
<td>Luo (2002)</td>
<td>Survey, 800, 36.36%, JVE China</td>
<td>Pos.**</td>
<td>Inv.U**</td>
<td>(C) **</td>
<td></td>
</tr>
<tr>
<td>Poppo and Zenger (2002)</td>
<td>Survey, 3000, 9.5%, B USA</td>
<td>Pos.**</td>
<td>Pos.**</td>
<td>(C) **</td>
<td></td>
</tr>
<tr>
<td>Lui and Ngo (2004)</td>
<td>Survey, 265, 33%, B Hong Kong</td>
<td>Pos.**</td>
<td>Pos.**</td>
<td>(CS) **</td>
<td></td>
</tr>
<tr>
<td>Gulati and Nickerson (2008)</td>
<td>Survey, 222 responses, 55%, B USA</td>
<td>Pos.**</td>
<td>Inv.U**</td>
<td>(CS) **</td>
<td></td>
</tr>
<tr>
<td>Li et al. (2010)</td>
<td>Survey, 580 responses, 65%, B China</td>
<td>(S) *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wang et al. (2011)</td>
<td>Survey, 850, 71.41%, B China</td>
<td>Pos.**</td>
<td>Inv.U**</td>
<td>(S) **</td>
<td></td>
</tr>
<tr>
<td>Huang et al. (2014)</td>
<td>Survey, 106, 19.38%, S Taiwan</td>
<td>Pos.**</td>
<td>Inv.U**</td>
<td>(C) *</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> AE=alliance executive; B=buyer, S=supplier, JVE=joint venture executive.

<sup>b</sup> Arg=Argentina; Can=Canada; Den=Denmark; Fra=France; Ger=Germany; Neth=Netherlands; †=multiple countries (8 and 19 respectively).

<sup>c</sup> RG=relational governance; CG=contractual governance; perf=performance; innov=innovation

<sup>d</sup> pos=hypothesized positive relationship; neg=hypothesized negative relationship; inv.U=hypothesized inverse-U relationship

* = partly significant; ** = significant; NO star = no significant relationship; (C) = complements; (S) = substitutes; (CS) = complements and substitutes.
Specifically, positive effects were established for performance outcomes such as sales growth, market share, competitiveness, and goal achievements (Claro, Hagelaar, & Omta, 2003; Ferguson et al., 2005; Griffith & Myers, 2005; Hoetker & Mellewigt, 2009; Paulraj, Lado, & Chen, 2008).

The second group of studies addresses the two governance modes collectively rather than separately (see the second section of Table 5.1). There are three schools of thought. The first school (indicated by (S) in Table 5.1) views contracts and trust as substitutes (Dyer & Singh, 1998). The underlying rationale is that trust reduces the need to specify and monitor contractual obligations and actions in detail (Gulati, 1995; Wang et al., 2011). When trust develops well, organizations need less contractual detail (Faulkner, 2000), as increased trust reduces the need for control over each other (Dyer, 1997; Nooteboom, 1996). Trust is thus viewed as an efficient governance mechanism that reduces transaction costs by replacing contracts (Dyer, 1997). In contrast, formal contracts can be considered a more costly substitute for relational governance (Uzzi, 1997). In their study on innovation in the Chinese manufacturing industry, Wang et al. (2011) find that contracts and trust are substitutes.

The second school (indicated by (C) in Table 5.1) argues that contracts and trust can complement each other’s inadequacies and limitations. Trust may complement contracts by fostering continuance and bilateralism when change and conflict arise, while contracts formally specify the unspoken assumptions that establish a basis for the development of trust. Ring and Van de Ven (1994) suggest that formal contracts lead to greater levels of trust by co-evolution. Poppo and Zenger (2002) find that higher levels of exchange performance are achieved when clearly articulated clauses that specify obligations and behavior are used in combination with trust. Similarly, a study of international joint venture performance indicates that performance increases when ventures use a combination of relational governance mechanisms and contracts (Luo, 2002).
Liu et al. (2009) find that the joint use of contracts and trust curb opportunism while at the same time increasing performance. Cannon et al., (2000) postulate that the process of drawing up a contract may stimulate information exchange between the parties, which creates a basis for the development of trust.

The third school (indicated by (CS) in Table 5.1) is formed by authors who find that contracts and trust can be both substitutes and complements. Gulati and Nickerson (2008) find that pre-existing trust is generally associated with choosing a less formal governance mode over a more formal mode, which suggests a substitution effect. They also find that pre-existing trust enhances exchange performance regardless of the governance mode chosen: here, trust has a complementary effect. Lui and Ngo (2004) provide more nuanced findings: goodwill trust and contracts serve as substitutes in explaining performance, while competence trust functions as a complement to contractual safeguard. Recently, Lumineau and Henderson (2012) indeed emphasized the importance of understanding the conditions under which the two types of governance affect performance.

Our objective is not to reconcile the many studies from these three schools. Rather, we use NCA to explore the notion that contracts and trust are both necessary but not sufficient for innovation. Assertions reflecting necessity are commonplace in management literature (Du et al., 2010); nevertheless, they have rarely been appropriately tested. Although the majority of claims regarding contractual detail and (goodwill and competence) trust are of an association-based nature, general claims of necessity (though perhaps not purposely) have been made regarding for example goodwill trust, which has been viewed as a fundamental ingredient for a buyer-supplier relationship’s long-term survival (Morgan & Hunt, 1994; Wang et al., 2011), and a critical predictor for future exchange (Uzzi, 1997). Investigating these claims of necessity is a valuable addition to the literature on contracts and trust as complements.
CHAPTER 5

5.3. NCA Methodology

“Managers should realize that incorporating term specificity and situational flexibility (i.e., contingency adaptability) in a Joint Venture contract is necessary for controlling opportunism and bolstering Joint Venture adaptation” (Luo, 2002, p. 917). This quotation illustrates that in regression-based research, researchers make necessary-condition statements in the managerial and discussion sections. Such statements are not valid in these analyses because they suggest that the independent variables are “critical” (in this case referring to the necessity of term specificity and contingency adaptability to control opportunism in joint-venture contracts). This is different from “critical” as explanatory power (i.e., considerably contributing to the variance in the value of the outcome variable does not mean that the variable is necessary for the outcome to occur (Dul et al., 2010)). Therefore, we need research methods that analyze whether variables are necessary to achieve a certain outcome, rather than investigating whether higher levels of variables lead to higher levels of outcomes.

A necessary condition is a condition that must be present to enable a certain outcome; without the condition the outcome will be absent (Dul et al., 2010). The presence of the condition does not automatically guarantee the outcome; the condition is necessary but not sufficient. Such statements have specific managerial implications: “put in place necessary condition X, or else you will fail.” This is in contrast to variance-based recommendations, which state that increasing the level of X will on average (but not always) lead to a certain increase in the level of the outcome.

The concept of necessary conditions can be applied to single antecedents (bivariate approach), or multiple antecedents (multivariate approach). In case of multiple necessary conditions, all conditions need to be put in place to prevent failure. A lower value for one causal factor cannot be compensated for by a higher value of another causal factor; i.e. necessary causal
factors cannot be traded off. The level of a certain necessary condition is hence not contingent on the levels (or presence) of other necessary conditions.

The concept of necessary conditions can furthermore be applied to dichotomous variables as well as to variables that have been measured using ordinal, interval, or continuous scales (Dul et al., 2010). In the dichotomous situation, for example, the independent variable (the necessary condition) and the dependent variable (the outcome) are either present or absent. The associated scatterplot of the observations is a 1x1 grid with (potentially) data points on each of the four corners (i.e., the intersections). Testing the necessary-condition hypothesis involves determining whether or not the intersection (condition: absent, outcome: present) (usually the intersection in the upper-left corner) has data points. If it does, the necessary-condition hypothesis is rejected. Note that in a dataset of N instances, a necessary condition hypothesis can be evaluated N times (one test per instance) (Dul et al., 2010).

The condition and the outcome can also be continuous with many categories, as is the case in the present study. The 1x1 grid then evolves into a regular scatterplot with more than four intersections, and the necessary-condition hypothesis is rejected when the upper-left part of the scatterplot has data points. The upper-left part is separated from the lower-right part by a so-called ceiling line (Goertz et al., 2013). Thus, whereas regression analysis involves drawing a line through the middle of the data points, in NCA the line is drawn between the areas with and without data points. The ceiling line indicates the level of the independent variable (the necessary condition) that is necessary (but not sufficient) for a given level of the dependent variable (the outcome).

The quality of a ceiling line that reflects the necessary condition can be evaluated in terms of the effect size (Dul, 2014) which refers to the constraint that the ceiling poses on the outcome. Goertz et al. (2013) and Dul (2014)

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33 Instances here refer to cases that have been subjected to (natural) experiments, or that have been studied in their real-life context without manipulation (Dul et al., 2010).
express the effect size as the size of the area without observations (i.e., the area above the ceiling, referred to as the ceiling zone) relative to the total space in which observations can be theoretically expected or empirically observed (i.e., the “scope”). The effect (i.e., the constraint) is stronger if the ceiling zone is larger. We select the empirical scope as the reference for calculating the effect size, for two reasons. First, it is unlikely that constructs will attain minimum scores, especially if they are measured using many items. In such cases, opting for the theoretical scope would lead to a substantial overestimation of the effect size. Second, Goertz et al. (2013) indicate that the empirical scope is more often selected for scope decisions. We consider a necessary condition to be absent if the effect size is smaller than 0.1 (Dul et al., 2014).

Ceiling lines can be drawn such that the ceiling zone contains either some or no observations. The number of observations above the ceiling line is referred to as the ceiling inaccuracy, and ceiling accuracy is the percentage of observations on or below the ceiling line (Dul, 2014). On the basis of a comparison of several ceiling lines, Dul (2014) suggests using the piecewise linear function “CE-FDH,” which is a data-envelopment ceiling line technique, or the linear function “CR-FDH,” which is a ceiling regression technique through the corner points of the CE-FDH function. These approaches are relatively stable and generally fit the data well. Both techniques assume non-decreasing (piecewise) linear ceilings that maximize the ceiling zone with few or no observations in the empty space. The advantage of CE-FDH is that it is more accurate than CR-FDH, because it allows no data points above the ceiling line. The advantage of CR-FDH is that it can be expressed as a linear function that can be used for additional calculations and estimations. We use both techniques to test our hypotheses.
5.4. Hypothesis Development

We now draw on social exchange theory and TCE to develop necessary-condition hypotheses for relational and formal governance respectively. As to our knowledge, relational and formal governance have not been conceptualized as necessary conditions, we start our hypothesis-building from regression-based governance research.

5.4.1. Trust and Innovation

Trust is generally defined as the “willingness of a partner to be vulnerable to the actions of another partner based on positive expectations regarding the other partner’s motivation and/or behavior” (Malhotra & Lumineau, 2011, p.982). According to social exchange theory, actors develop trust and other affective orientations towards their partners in the face of the uncertainties surrounding reciprocal exchange (Cook & Rice, 2003). Trust then concerns both parties fulfilling collaborative roles in a risky situation, and relates to both parties’ expectations of the other’s intentions and ability to perform (Lui & Ngo, 2004).

While the former has traditionally been emphasized in reciprocal exchange, more recently, emphasis has shifted to reputation rather than affect-based trust (Cook & Rice, 2003). Hence, in this study, we address two dimensions of trust: 1) goodwill trust and 2) competence trust.

Goodwill trust is trust that a partner intends to fulfill its role in the collaboration, particularly trust that the partner will refrain from opportunistic behavior (Das & Teng, 2001; Lui & Ngo, 2004; Nooteboom, 1996). Goodwill trust instigates cooperation within the IOR and has been viewed as a fundamental ingredient for an IOR’s long-term survival (Morgan & Hunt, 1994; Wang et al., 2011). Uzzi (1997) states that goodwill-based trust is a critical predictor for future exchange. These claims hint at the necessity of goodwill trust for ongoing inter-firm collaborations.
Goodwill trust lowers transaction costs and curbs opportunistic behavior in IORs, thereby making more energy and resources available for absorbing and utilizing knowledge that can result in innovative outcomes (Lane et al., 2001; Wang et al., 2011). In addition, goodwill trust creates a mutual orientation toward joint problem solving, quality improvement, cost reduction, and innovation in production and management methods (Kramer, 2006). Furthermore, when goodwill trust is present, there is closer cooperation, a more open information exchange, and a higher degree of commitment between the parties (Fryxell et al., 2002; Lui & Ngo, 2004). The interaction among the parties is more informal, leading to the creation and sharing of knowledge that may result in innovation (Wang et al., 2011). In addition, goodwill trust increases transparency and creates the possibility of learning from the partner (Lane et al., 2001; Wang et al., 2011). It positively affects the ability of the parties to manage the objectives of mutual learning and to protect their core proprietary assets (Kale et al., 2000; Wang et al., 2011).

Building on these sources, we argue that in the absence of goodwill trust, the parties might be unwilling to exchange the information and knowledge that could lead to innovative outcomes. Goodwill trust seems to be required for close inter-firm cooperation and for the mutual orientation that allows for example joint problem solving. Hence, we propose:

**Hypothesis 1:** To achieve a high level of innovation in an IOR, goodwill trust is necessary.

Competence trust refers to the confidence parties have in each other’s technical, cognitive, organizational, and communicative competences (Klein-Woolthuis et al., 2005). It is the expectation that they both have the ability to fulfill an agreed-upon obligation (Das & Teng, 2001; Lui & Ngo, 2004; Nooteboom, 2006). Hence, competence trust reduces the perceived risk of underperformance.
Given the inter-firm nature of innovation generation through e.g., knowledge sharing, both parties need to have confidence in the other’s ability to meet the agreed-upon obligations. A lack of competence trust lowers the chance of innovation (Roy et al., 2004). If competence trust is present, there is less need for repeated explanations of the obligations. This results in less frequent but higher-quality communication, which may lead to innovation (Nooteboom et al., 1997; Roy et al., 2004). Trusting a partner to be competent also increases the chance that the parties will learn from the interaction. Both parties are more likely to listen to each other, and absorb and take action on the information and knowledge received (Levin & Cross, 2004).

We thus argue that competence trust is required for the willingness to share and absorb innovation-related information and knowledge. Thus:

**Hypothesis 2:** To achieve a high level of innovation in an IOR, competence trust is necessary.

### 5.4.2. Contracts and Innovation

Contracts are written agreements that are legally binding (Lyons & Mehta, 1997; Woolthuis et al., 2005); they represent promises and obligations to perform future actions (Poppo & Zenger, 2002). Contracts provide safeguards against ex-post performance problems and reduce the risks resulting from opportunism on the part of either or both parties (Luo, 2002; Williamson, 1985). An important feature of contracts is the level of contractual detail, i.e., the extent to which contractual clauses related to obligations, behaviors and future contingencies are specified (Luo, 2002).

We argue that contracts can curb opportunism in an IOR, which facilitates knowledge transfer and improves innovation performance. According to TCE, contracts are drafted to match the exchange conditions that accompany transactions, such as asset specificity, uncertainty, and frequency (Williamson,
The theory asserts that these exchange conditions affect the extent to which the parties involved are exposed to opportunism, which in turn may be curbed by drafting more detailed contracts (Williamson, 1985). Detailed contracts provide a framework for behavior, prescribe the appropriate behavior of the parties in addition to each partner’s role and obligations, the way the outcomes are allocated, how to act in the event of future contingencies, and state the penalties for violating the contractual agreement (Poppo & Zenger, 2002; Wang et al., 2011).

Thus, detailed contracts limit opportunistic behavior via detailed clauses that specify the punishment in the event of contract breach (Luo, 2002). In addition, detailed contracts decrease uncertainty about behavior and outcomes (Wang et al., 2011), thereby limiting the range and severity of the risks to which an IOR is exposed (Poppo & Zenger, 2002). Contracts also provide a way to deal with conflicts during knowledge exchange (Wang et al., 2011), since the contract specifies the action to take in the event of conflict (Ring & Van de Ven, 1994). The costs and risks associated with knowledge transfer and innovation are reduced when a detailed contract underlies the IOR (Wang et al., 2011). Based on this, we argue that a certain degree of contractual detail is necessary for the knowledge exchange process that is required for innovation. We thus put forward the following hypothesis:

**Hypothesis 3**: To achieve a high level of innovation in an IOR, contractual detail is necessary.

### 5.5. Research Methods

#### 5.5.1. Research Design and Data Collection

The data for this study originated from a 2013 survey of buyer-seller relationships in the maintenance sector because such relationships are well
known for the use of both formal and relational governance mechanisms. In the context of maintenance, innovation may concern minor changes that lead to a more efficient maintenance process (i.e., a performance dashboard which diagnoses specific problems in advance of the supplier’s site visit), or more major changes that increase the effectiveness of the maintenance process (i.e., changing certain components to reduce overall maintenance activities).

We administered our survey to the 1227 members of the Dutch association for maintenance services (in Dutch: Nederlandse Vereniging voor Doelmatig Onderhoud, NVDO). These members are either buyers of maintenance services (430), providers of maintenance services (430), or consultants (367). Our analyses are based on the data collected from the 430 buyers of maintenance services. We first contacted the board of NVDO to obtain its approval and support, and we subsequently presented the research as a joint effort, with the goal of maximizing the number of data points. A letter announcing the survey and when it would be distributed was sent out to all members. We sent the questionnaire accompanied by an introductory letter explaining the intent of the study, assuring confidentiality, and indicating the preferred informant (i.e., a manager with knowledge of the content of the contract and collaboration). These informants were subsequently asked to complete the questionnaire for a specific service contract, which could be any of three commonly used contract types: fixed-price contracts, cost-plus contracts, and performance-based contracts (Kim et al., 2007). Incorporating multiple types of contracts ensures variation in our key variables: e.g., the contractual detail will be lower for a performance-based contract than for a cost-plus contract.

This study uses a subset of the data used in study 3. Given that the difference between whether a buyer or a sellers responds to the survey is significant, it was decided not to take the full set of the data because the NCA method cannot control for confounding factors. Hence, it was important to create a homogeneous dataset. We chose to present the results of buying firm for several reasons; in a regular contractual relationship where the supplier is not contracted for innovation but rather a regular service, it is usually the buyer who is seeking innovation to lower their costs, increase end-user satisfaction and who will immediately observe the results of an innovative activity. In addition, given that organization’s perspective is widely adopted in operations management (Paulraj et al., 2008), we opted for using the buyer’s perspective.
contract. To ensure reliable answers, the informants were asked to select the contract type with which they were most familiar.

After three rounds of follow-up reminders, newsletter announcements, and calls to members who had not responded, we received 78 questionnaires from buyers of maintenance services, resulting in an overall response rate of (78/430) 18.4%. Of these 78 responses, 30 were discarded due to excessive missing information, which resulted in 48 usable responses. The limited size of our dataset has implications for generalizability; and we will return to this in our limitations section when we discuss generalizability in NCA in more detail.

Of the 48 responding firms, 19 are active in the process industry, 11 in the real-estate sector, 8 in food, beverage, and pharmaceuticals, 5 in infrastructure, 4 in manufacturing, and 1 in the fleet sector. Maintenance manager (7), contract manager (5), advisor (5), and general manager (5) were the most common roles of respondents. Furthermore, around 55% of the organizations have more than 250 employees, and the average revenue is around €2192 million (range: €0.15 to €38,000 million). On average, the respondents have 13 (range: 0–30) years of experience in managing relationships with external suppliers and they managed, on average, 19 (range: 0–50) contracts in 2012. These figures suggest that the informants have a high level of competence, indicating that the responses should be of sufficient quality.

Potential respondent bias was assessed by comparing early and late respondents assuming that the opinions of the latter are representative of those that do not respond at all (Armstrong & Overton, 1977). The final sample includes 33.3% of the responses in the first wave and 66.7% in the second wave after the first reminder. We investigated at several characteristics such as the sector the respondent is active in, the respondent’s function, the number of employees of the respondent’s organization, and the number of contracts managed by the respondent in 2012. We also investigated scores for goodwill trust, competence trust, contractual detail, and innovation of early and late
respondents and found no substantial differences. This, in combination with the fact that non-respondents indicated lack of time as the main reason for non-participation, suggests that non-response bias is not a concern.

5.5.2. **Measures**

We relied on existing scales as much as possible, and we made minor modifications only when necessary given our research objectives and context (Appendix E discusses how we measured our key variables; note that there are no control variables as we explore the presence of necessary conditions within each instance). In line with previous research, we interviewed and pre-tested the survey with eight respondents—from firms not included in our analysis—and with researchers in business management from different universities. The goal of this step was to identify ambiguities in the terms and concepts (Luo, 2002). We also asked whether the wording was appropriate for business practitioners; we made minor changes to the wording based on the feedback received.

The items were measured using five- or seven-point Likert scales, i.e., 1 (strongly disagree) to 5 or 7 (strongly agree). For the purpose of our analysis, we assume that these are interval scales (i.e., scales with equal distances between 1 and 2, 2 and 3, etc.; this assumption is in line with the majority of business studies based on survey data captured by Likert scales). Recall furthermore that we build our analysis on the empirical scope, and that the empirical minimum and maximum may deviate from the theoretical minimum and maximum.

**Innovation:** The innovation items were derived from the scale of exploitative (i.e., incremental) innovation proposed by Jansen et al. (2006), and were modified to fit the sector being investigated by other researchers in their study on the use of PBCs in the maintenance sector (Verbeeten, 2014). We considered innovation to be incremental in nature as we expect these types of innovations to occur regularly in our research context. The items focus on e.g.,
the extent to which the maintenance provider improves the maintenance process and/or refines the delivery of existing products and services. Given the nature of the maintenance sector and the sorts of innovations that could reasonably be pursued, we consider it appropriate to focus on incremental innovations like using a different spare part that is less subject to wear. Nevertheless, we also measured the more explorative (i.e., radical) innovative activities. The results of radical innovation, are shown in appendix F. Our final scale of incremental innovation is a seven-item, five-point Likert scale, for which the empirical minimum is 7 and the empirical maximum is 35 (equal to the theoretical minimum and maximum). Between the minimum and maximum, there are 21 construct levels resulting from the combined scores on the seven items measuring this construct: 5, 6, 7, …, 35.

**Goodwill trust:** For goodwill trust we used an existing seven-item, five-point Likert scale based on the work of Aulakh et al. (1996) and Green (2003). It measures whether or not the parties intend to fulfill their role in the collaboration (e.g., will not withhold information needed to perform well, will not exploit temporary weaknesses of the other to their own advantage). The empirical minimum of goodwill trust is 17; the empirical maximum is 35. The 19 construct levels are 17, 18, 19, …, 35.

**Competence trust:** We follow previous research that defines and measures competence trust as the degree of trust the parties have in the other’s ability to fulfill the agreed-upon obligations (Das & Teng, 2001). We measure competence trust using a two item, five-point Likert scale, which measures whether the parties trust that both have the right resources and whether they acknowledge each other’s reputation and abilities (Lui & Ngo, 2004). Competence trust can assume 5 construct levels between the empirical minimum of 6 and the empirical maximum of 10.

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35 Note that construct scores are usually averages. The score for innovation can then also assume 21 values: 1, 1.25, 1.50, …, 5. This does not differ from the situation in which the scores are summed, as is the case in our analysis.
**Contractual detail**: Early TCE researchers have not operationalized contractual detail since the focus of TCE researchers was mainly on the effects of transaction characteristics on the make or buy decision. We therefore had to rely on the small amount of research that is available on the effects of contracts to find a valid and reliable measure for this variable. Our formative seven-item, seven-point Likert scale captures the two dimensions of contractual detail: term specificity and contingency adaptability. Based on the items developed by Argyres et al., (2007), Mayer (2006), and Ryall and Sampson (2009) we captured contractual detail using items that e.g., evaluate whether the contract states how the supplier should develop certain technologies and whether the supplier has the freedom to adapt to unforeseen circumstances in the way they think best. These items are similar to those used in existing research, and they provide the buyer’s perspective on the level to which the contractual terms are specified (Mooi & Ghosh, 2010). Contractual detail can assume 28 construct levels with the empirical minimum of 13 and the empirical maximum of 40.

### 5.5.3. **Construct Reliability and Validity**

We used expectation maximization to replace a small number of missing values and then employed confirmatory factor analysis (CFA by using partial least squares (PLS)) to validate the measures of the reflective constructs (i.e., (incremental) innovation, and goodwill and competence trust). In line with previous research, we followed Gefen and Straub’s (2005) guidelines to validate the reflective measures by using standard factorial validity for PLS (Im and Rai, 2008), whereas the formative construct (i.e., contractual detail) was validated

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36 We do acknowledge that contractual completeness/detail has two dimensions (i.e., term specificity and contingency adaptability). Given that PBCs are characterized by term specificity we only focused on that element in the first three studies. However, in this study we incorporated a broader view of contractual completeness by incorporating both elements. That is also why contractual completeness was operationalized as a formative construct because both elements are not the same and would not correlate. Thus, a reflective measure is not appropriate here. Because we incorporated both elements, we also implemented more items (i.e., 7). Especially because our studies are one of the first to operationalize these variables for survey studies, we believe that we should have as much items so that we do not leave any important aspects of the variable out.
following guidelines as put forward by Diamantopoulos and Winklhofer (2001) and Petter et al., (2007). We used PLS to validate our reflective constructs because it is useful when researchers have small sample sizes (Hair, 2010; Im & Rai, 2008; Petter et al., 2007), which is the case in our research.

Table 5.2 presents the descriptive statistics and the bivariate correlations among the variables. All indicators load high (>0.5) on their respective construct and are significant at a 1% significance level, providing evidence for unidimensionality and convergent validity. Composite reliabilities (CRs) exceed the 0.70 threshold for all reflective constructs (Bagozzi & Yi, 1988). In addition, the average variance extracted (AVE) values exceed the 0.50 threshold and Cronbach’s alpha’s of the constructs range from 0.70 to 0.89 (see Appendix E for the overall psychometric properties of the measures). We used AVE and compared this to the squared correlation between construct pairs to assess discriminant validity (Fornell & Larcker, 1981). The AVEs are larger than the squared correlations between constructs, indicating that each construct explains more of its variance in its item measures than it shares with other constructs. In addition, our data does not deal with cross-loadings. These results provide evidence of discriminant validity among the theoretical constructs.

Table 5.2: Descriptive Statistics and Pearson Correlation Matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Empirical Min.-Max.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Innovation</td>
<td>2.91</td>
<td>7–35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Contractual detail</td>
<td>3.51</td>
<td>13–40</td>
<td>.439</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Goodwill Trust</td>
<td>3.85</td>
<td>17–35</td>
<td>.467</td>
<td>.449</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Competence Trust</td>
<td>4.10</td>
<td>6–10</td>
<td>.412</td>
<td>.293</td>
<td>.734</td>
<td></td>
</tr>
<tr>
<td>Cronbach’s Alpha</td>
<td></td>
<td></td>
<td>.919</td>
<td></td>
<td>.882</td>
<td>.703</td>
</tr>
<tr>
<td>Composite Reliability</td>
<td></td>
<td></td>
<td>.935</td>
<td></td>
<td>.904</td>
<td>.867</td>
</tr>
<tr>
<td>Average Variance Extracted (AVE)</td>
<td></td>
<td></td>
<td>.675</td>
<td></td>
<td>.575</td>
<td>.766</td>
</tr>
</tbody>
</table>

N= 48
The formative construct, contractual detail, required a different approach for validation, because the assessment of convergent validity is not meaningful for formative constructs (Diamantopoulos & Winklhofer, 2001; Im & Rai, 2008; Petter et al., 2007). In line with previous research, we first established content validity to capture the domain of the construct (Im & Rai, 2008). We conducted an extensive literature review to understand the meaning of the construct and develop a preliminary indicator list. We then interviewed purchasing managers and academic experts to better understand and further refine the indicators.

To minimize concerns about common method bias, we incorporated remedial procedures (Podsakoff et al., 2003). First, the pretest we conducted before survey administration minimized item ambiguity and any comprehension problems for the response process. In addition, we guaranteed response anonymity, which reduces respondents’ tendency to provide socially desirable answers (Smets et al., 2013). Finally, in order to test the presence of common method bias among the dependent variable (innovation) and the three independent variables we used Harman’s one-factor test (Podsakoff & Organ, 1986). Principal component analysis showed that the first factor accounts for 31.4% of the variance, suggesting that the observed variance cannot be explained by one underlying factor (Im & Rai, 2008). Collectively these tests indicate acceptable psychometric properties for the measured variables.

5.6. Results

We now turn to our results, which are summarized in Table 5.3. We illustrate the content of Table 5.3 using our first hypothesis, which postulates that goodwill trust is necessary for a high level of innovation in IORs. Figure 5.1 shows the scatterplot for these two variables.
Figure 5.1: Scatterplot for Goodwill Trust and Innovation ($y=15.293+0.484x$)

Table 5.3: Results of Necessary-Condition Analyses using Ceiling Regression

<table>
<thead>
<tr>
<th>Construct</th>
<th>Method</th>
<th>Accuracy</th>
<th>Ceiling zone</th>
<th>Scope</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1-Goodwill trust</td>
<td>CE-FDH</td>
<td>100%</td>
<td>163.31</td>
<td>510.30</td>
<td>.32</td>
</tr>
<tr>
<td>H2-Competence trust</td>
<td>CR-FDH</td>
<td>92%</td>
<td>134.48</td>
<td>510.30</td>
<td>.26</td>
</tr>
<tr>
<td>H3-Contractual detail</td>
<td>CE-FDH</td>
<td>100%</td>
<td>186.62</td>
<td>765.45</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>CR-FDH</td>
<td>96%</td>
<td>147.81</td>
<td>765.45</td>
<td>.19</td>
</tr>
</tbody>
</table>
It is observed that this scatterplot contains what Goertz et al. (2013) call a triangular no-data pattern, and a ceiling regression line through the upper data points can be drawn. This ceiling regression line and the associated ceiling accuracy, ceiling zone, scope, and effect size are estimated using NCA software (Dul, 2014). For innovation versus goodwill trust, the total space in which observations can be empirically observed (i.e., scope) is 510.3. The CE-FDH technique results in a ceiling zone of 163.31, and the associated effect size (i.e., the ceiling zone divided by the scope) is 163.31/510.3 = 0.32. Recall that the CE-FDH technique does not allow data points above the ceiling line, and hence ceiling accuracy is 100%. The CR-FDH technique results in a ceiling zone of 134.48 and an effect size of 0.26, with a ceiling accuracy of 92%. Based on the guidelines of Dul (2014) for the magnitude of an effect size (<0.1: “small effect”; 0.1 ≤ c ≤ 0.3: “medium effect”; >0.3 “large effect”; >0.5: “very large effect”), these are large and medium effect sizes. We therefore conclude that a necessary condition is present in our data. The fact that Figure 5.1 contains data points below the ceiling line suggests furthermore that goodwill trust is not sufficient for innovation to occur. Hence, it is argued that goodwill trust is necessary but not sufficient for innovation, meaning that hypothesis 1 is supported. The associated ceiling line function reads as: y = 15.293 + 0.484x, and can be found above Figure 5.1.

A similar approach was adopted for the other two hypotheses (see Figures 5.2 and 5.3 for the scatterplots for competence trust and contractual detail respectively). We now use the results in Table 5.3 to test the hypotheses. H2 postulates that competence trust is required for a high level of innovation. Figure 5.2 shows the associated scatterplot. The effect sizes are 0.33 and 0.22 for CE-FDH and CR-FDH respectively. For the latter technique, the ceiling accuracy is 94%. These effect sizes can again be considered large and medium, and we therefore conclude that a necessary condition is present in the data meaning that hypothesis 2 is supported. Figure 5.2 contains data points below
the ceiling line and hence competence trust is not sufficient for innovation to occur. It is therefore stated that competence trust is necessary but not sufficient for innovation. The associated ceiling line function reads as: \(y=8.4+2.59x\), and can be found above Figure 5.2.

Finally, H3 states that contractual detail is required for a high level of innovation. The effect size for CE-FDH is 0.24; for CR-FDH it is 0.19, with a ceiling accuracy of 96%. These are medium effect sizes for which we conclude that a necessary condition is present in the data and that hypothesis 3 is thus supported. Figure 5.3 contains data points below the ceiling line, indicating that contractual detail is not sufficient for innovation to occur. It is therefore stated that contractual detail is necessary but not sufficient for innovation. The associated ceiling line function reads as: \(y=15.208+0.56x\) (Figure 5.3).

**Figure 5.2:** Scatterplot for Competence Trust and Innovation (\(y=8.4+2.59x\))
5.6.1. Combined effects of contract and trust

The results of our hypothesis tests indicate that we have identified three necessary conditions. We can add more detail to our analysis by considering the levels of the variables in combination and identifying the required levels of each of the three conditions given the desired level of innovation. To illustrate: the ceiling regression function for goodwill trust indicates that an innovation level of 30 requires a level of goodwill trust of at least 30.39. If it is lower, an innovation of 30 cannot be achieved. However, a value of 30.39 does not guarantee that an innovation of 30 will be achieved: in Figure 5.1, data points 23 and 43 for example have levels of goodwill trust of 31, but innovation levels of 17.99 (!) and 21.98 respectively. When considering the levels of the other conditions, we find that for both organizations, the actual level of competence
trust (8) does not meet the level of competence trust (8.34) that enables an innovation level of 30 (note that the level of contractual detail (38 and 37 for organization 23 and 43 respectively) does exceed the level of 26.41 which is required for an innovation level of 30). Thus, if the managers of these organizations have the ambition to achieve an innovation level of 30, they should try to increase their level of competence trust. This can be done for example by choosing a partner with better problem-solving behavior than the current partner (improving the partner’s qualities) or by enhanced internal communication about the partner’s problem-solving (increasing the perceptions of the partner’s qualities).

Table 5.4 is a “bottleneck table” (Dul, 2014) that specifies for each level of innovation the threshold levels for the three necessary conditions in percentages of the highest possible levels of these conditions as observed in our dataset. For our discussion, we split our set of observations into three groups with respect to the observed values of the dependent variable. Innovation levels up to 55% of the highest possible innovation level are considered low; this innovation level is achieved by about half the organizations in our dataset. Innovation levels above 55% but below 90% (achieved by about 40% of the organizations in our dataset) are considered medium, and innovation levels above 90% (achieved by about the top 10% of the organizations in our dataset) are considered high.

Table 5.4 shows that for innovation ambitions up to 55% none of the conditions is a bottleneck (note that we consider the small threshold value for contractual detail to be the result of measurement error). Organizations pursuing a medium innovation level (60%) will need at least 5.6% of the highest possible level of goodwill trust, at least 0.68% of the highest possible level of competence trust and at least 10.08% of the highest possible level of contractual detail. Organizations that aim for high innovation (90% or higher) need the maximum possible level of goodwill trust (100%), very high levels of
competence trust (82.77% - 100%) and medium to high levels of contractual detail (66.35% - 85.11%).

Table 5.4: Bottleneck Levels (in %) using Ceiling Regression (NA= no bottleneck)

<table>
<thead>
<tr>
<th>Innovation</th>
<th>Goodwill trust</th>
<th>Competence trust</th>
<th>Contractual detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>10</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>20</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>30</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>40</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>50</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>55</td>
<td>NA</td>
<td>NA</td>
<td>0.71</td>
</tr>
<tr>
<td>60</td>
<td>5.60</td>
<td>0.68</td>
<td>10.08</td>
</tr>
<tr>
<td>65</td>
<td>21.87</td>
<td>14.36</td>
<td>19.46</td>
</tr>
<tr>
<td>70</td>
<td>38.14</td>
<td>28.04</td>
<td>28.84</td>
</tr>
<tr>
<td>75</td>
<td>54.40</td>
<td>41.72</td>
<td>38.22</td>
</tr>
<tr>
<td>80</td>
<td>70.67</td>
<td>55.41</td>
<td>47.60</td>
</tr>
<tr>
<td>85</td>
<td>86.94</td>
<td>69.09</td>
<td>56.97</td>
</tr>
<tr>
<td>90</td>
<td>100.00</td>
<td>82.77</td>
<td>66.35</td>
</tr>
<tr>
<td>95</td>
<td>100.00</td>
<td>96.45</td>
<td>75.73</td>
</tr>
<tr>
<td>100</td>
<td>100.00</td>
<td>100.00</td>
<td>85.11</td>
</tr>
</tbody>
</table>

So far, we have discussed examples of underperformance on one or more of the necessary but not sufficient conditions. In contrast, there can also be situations of over performance, something which Dul (2014) refers to as condition inefficiency. Condition inefficiency occurs when for a certain innovation level, the actual level of the condition exceeds the associated threshold value. For example, Organization 48’s level of goodwill trust of 32 and of competence trust of 10 both exceed the thresholds required for an innovation level of 30. This organization is dealing with condition inefficiency for goodwill trust and for competence trust. At the same time, its current level of contractual detail is 23, whereas a level of 26.41 is required to enable an innovation level of 30. Indeed, Organization 48 currently has an innovation level of 17.99. The manager of this organization had thus better increase the level of contractual detail. In general, managers that are confronted with condition
inefficiency should redirect their attention and invest in the bottleneck conditions. Our analysis therefore also provides valuable insight into the extent to which organizations make efficient use of their resources.

5.7. **Discussion and Conclusion**

Contracts and trust have been extensively studied in relation to various inter-organizational outcomes, mostly using variance-based research methods. However, these studies have not investigated the extent to which contracts and trust are critical for relational outcomes to occur.

We use the NCA methodology to investigate whether contracts, interpreted as contractual detail, and trust, consisting of goodwill and competence trust, are critical (necessary) conditions for a specific relational outcome, innovation. A condition is necessary if the desired outcome does not occur in the absence of the condition. A necessary condition is not sufficient for the outcome to occur, but its absence ensures that the outcome will not be achieved, whatever the level of the other factors.

We find that in our dataset contractual detail, goodwill trust, and competence trust are all necessary conditions for innovation. Based on the guidelines in Dul (2014), the effect sizes can be considered substantial. From a practical perspective, the effect sizes indicate that the conditions must be in place to allow for a high level of innovation. Our results also suggest that contracts and trust are complements in explaining innovation, since organizations with strong innovation ambitions should ensure that they have the required levels of contractual detail, goodwill trust, and competence trust (i.e., they need both contracts and trust).

We also find that organizations need different levels of contractual detail, goodwill trust, and competence trust, depending on their innovation ambition. Our identification of multiple necessary conditions enabled a
multivariate NCA, which allowed us to evaluate in more detail the combined effect of the necessary conditions. Basically, we determined for each condition the level that is necessary for a desired level of the outcome. These levels are summarized in Table 5.4. Note that in general, it is not possible to compensate for a condition that fails to meet its threshold, as a necessary condition by definition needs to be present to enable a certain outcome.

Our findings regarding the necessity of both contracts and trust are in line with existing research that views contracts and trust as complements. We advance this literature by identifying the combinations of contractual detail, goodwill trust, and competence trust that are required for different levels of innovation. Our research also adds to the innovation literature by providing empirical evidence for the relationship between contracts, trust, and innovation. The latter has rarely been adopted as the outcome in inter-firm governance research, despite it being a fundamental element of the value-creating potential of IORs (Wang et al., 2011). Finally, the application of NCA constitutes a methodological contribution: our study is one of only a few empirical studies investigating necessary conditions in business research.

From a managerial perspective, this research provides insight into the critical conditions for innovation in buyer-supplier relationships. Our results suggest that organizations will only be able to realize a certain level of innovation if appropriate levels of contractual detail, goodwill trust, and competence trust are put in place. If Organization 41 in Figures 1-3, with innovation 14 (40% of maximum observed level in the sample), goodwill trust 17 (48.57%), competence trust 6 (60%), and contractual detail 19 (47.5%) has an innovation ambition of 26.25 (75%), then Table 4 shows that it will have to raise its current level of goodwill trust from 48.57% to 54.4%, whereas the other resources are large enough. On the other hand for, Organization 18 (goodwill trust: 89%; competence trust: 90%; contractual detail: 100%), all the conditions are met; yet, their innovation is relatively poor (only 66%). This observation
again underlines that necessary conditions only enable outcomes; they do not guarantee outcomes: the conditions are necessary but not sufficient. Apparently, other factors, which we did not investigate, have an impact here as well. Finally, we find that eight organizations in our data set deal with condition inefficiency, as the levels of contractual detail at these organizations well exceeds the threshold values for their current innovation performance. These organizations could redirect the effort that goes into crafting detailed contracts to other matters, possibly to raising the level of the bottleneck conditions as to enable a higher level of innovation. As an example, organization 22 (innovation 71%; goodwill trust 89%; competence trust 100%; contractual detail 100%) has a level of contractual detail that exceeds the level required for the highest possible level of innovation. This organization should invest in developing higher levels of goodwill trust, as the current level of this condition trust inhibits higher innovation performance (i.e., goodwill trust is the bottleneck). Our analysis therefore provides valuable insight into the extent to which organizations make efficient use of their resources.

Our study has some limitations. First, the data set contained a relatively small set of forty-eight instances from a specific context, the Dutch maintenance industry, which raises questions with regard to the extent to which our findings are generalizable. Although our sample can convincingly illustrate the presence of, and interplay between the different necessary conditions for innovation, different samples are likely to result in different ceiling lines. For this reason, it would be useful to establish confidence intervals, as to facilitate systematic comparison of effect sizes and accuracy of ceiling lines across studies (Dul, 2014). However, approaches for establishing confidence intervals for NCA do not exist yet (Dul, 2014). We recommend replications of this study using different samples, for example from other industries and other countries. Similar results in new studies would enhance our confidence in the necessary conditions found, and enable further demarcation of the domain in which the conditions
apply. It would also help us to understand how robust these conditions are: perhaps high levels of contractual detail are less important in cultures that place a stronger emphasis on relationships.

Second, the results of this study are based on a single perspective of the buyer-supplier relationship, namely the buyer’s perspective. Studies of buyer-supplier relationships benefit from dyadic data collection. Including data from the suppliers for the buyer-supplier relationships studied may influence our findings by affecting the scores on trust. However, we measured goodwill and competence trust as a bidirectional relationship construct (i.e., “both parties trust that each will stay within the terms of the contract”) as opposed to a unidirectional trait of the buyer (i.e., “we trust that the supplier will stay within the terms of the contract”). We therefore expect that this influence will not be dramatic. Future research, however, should explore two-sided data collection.

Other future research directions include the study of other performance outcomes (such as profits or satisfaction). As Schepker et al. (2014) note, more research is needed on the effects of contracts on performance outcomes.

This study sought to extend prior research on the effects of formal and relational governance on performance outcomes in IORs. It draws on a methodology that is rather new in the social sciences in general and in business research in particular. However, we feel there is substantial merit to expressing findings in terms of their necessity for attaining certain results (e.g., innovation, or more generally performance/success). We hope that other researchers will consider this approach a useful addition to their existing toolkit and start looking for necessary conditions in their data sets (Dul et al., 2010), since we believe that necessary conditions have strong managerial relevance. Business research is also about making clear and effective managerial recommendations: NCA results provide such recommendations.
CHAPTER 6

Conclusions, Theoretical Contributions, Practical Implications, and Future Research Directions

The objective of this dissertation was to advance existing knowledge on how the characteristics of performance-based contracts affect innovation in inter-organizational relationships. Additionally, this dissertation also investigated which combinations of contracts and trust are necessary for achieving innovation. To fulfill these objectives, four studies with different research methodologies were conducted in this dissertation. This final chapter summarizes and discusses the results of the four studies with overarching conclusions. The chapter continues with the practical and theoretical implications of the dissertation as a whole, and concludes with a discussion of limitations and directions for further research.

37 The majority of the work in this chapter has been done by the author of this dissertation. The feedback from the promtors and co-promotors during several revision rounds has been implemented.
6.1. Synopsis

The shift towards focusing on contracting for services surrounding a product has increased the importance of using contracts that focus on output, outcomes and performance to be delivered by the partner rather than the processes of delivering the service or the inputs used. Traditional contracts will be less successful when contracting for service oriented offerings, since they merely focus on achieving lowest costs, rather than focusing on the values that could be created with inter-organizational relationships (IORs). As a result, performance-based contracts (PBCs) have gained popularity as a way of contracting in service oriented IORs, as these contracts are said to foster innovation and align the interests of both parties.

PBCs are contracts that underline the outcome of the transaction, rather than prescribing how to perform the transaction or which resources to use. Though several authors have acknowledged the positive effects of such contracts on innovation, none of the research empirically studies how this effect occurs. Moreover, studies rarely link contracts to performance outcomes. Hence, despite the importance of the performance implications of contracts for academics and practitioners, the question of how (incomplete) contracts, such as PBCs, affect innovation in IORs is insufficiently answered. In addition, despite the increasing importance of relational governance in IORs and the large amount of research on contracts and trust, there is little consensus on the relationship between trust, contracts, and innovation. It thus becomes difficult whether managers should emphasize contracts and/or trust in achieving innovation. Therefore, the objectives of this dissertation were to resolve these issues by focusing on (i) to what extent incomplete contracts, such as PBCs, affect innovation and (ii) which combinations of contracts and trust are necessary in achieving innovation. To provide insights into these research questions, four studies were conducted. The following sections provide a summary of the key findings of these studies.
6.2. Key Findings of the Chapters

6.2.1. Chapters 2 and 3: How the characteristics of incomplete contracts, such as PBCs, affect Innovation (studies 1 and 2)

Study 1 made use of an extensive literature review to identify the characteristics of PBCs and develop a conceptual model that explains how these characteristics affect innovation. Contrary to existing research, the propositions were built on the collective use of transaction cost economics (TCE) and agency theory (AT).

TCE proposes that the IOR can be protected from opportunism by the degree of contractual completeness, and AT focuses on the way the partner is rewarded. PBCs can be characterized in terms of these two solutions to partner opportunism: low term specificity and the partner’s rewards that are linked to performance (i.e., pay-for-performance). TCE suggests that low term specificity gives the partner the autonomy to decide how to attain the performance goals, and control over the processes and procedures of their own work, which in turn results in innovative activities. However, excessive low term specificity creates the potential for the partner to act opportunistically, resulting in an overall lower quality and value of the innovative activities. Moreover, study 1 also argued that an excessively high degree of term specificity is detrimental for innovation. Hence, it was argued that there is an inverse U-relationship between term specificity and innovation. Furthermore, it was found that linking rewards to performance positively affects innovation. Finally, the more risk-averse the partner, the less it will engage in innovative activities, as the partner will be less sensitive to the pay-for-performance clause.

To empirically refine the conceptual model and understand the mechanisms underlying the relationship between PBCs and innovation as certain PBCs are more successful than others in terms of achieving innovation, study 2 made use of two cases of performance-based IT-service contracts. The most important finding of this study was related to term specificity. It was observed that partner autonomy, created through low term specificity as such, will not
result in innovation: it appears to be the granted autonomy given to the partner in the day-to-day operations of the service delivery that allows the partner to use their knowledge and experience to optimize the service process.

6.2.2. Chapter 4: Empirical Test of the Relationship between the characteristics of incomplete contracts, such as PBCs, and Innovation (study 3)

The aim of study 3 was to empirically test how the contractual characteristics of a PBC affect incremental and radical innovation. For that, study 3 used a survey-based research approach, whereby data was collected from 106 buying and selling organizations active in the Dutch maintenance industry.

The results showed that term specificity is inverse-U related to incremental innovation. On the other hand, term specificity negatively affects radical innovation. Second, the results showed that pay-for-performance positively affects both incremental and radical innovation. Moreover, the effect of pay-for-performance is stronger for radical innovation than for incremental innovation. Third, the partner’s degree of risk-aversion positively moderates the relationship between pay-for-performance and incremental and radical innovation. This means that under pay-for-performance conditions, a risk-averse partner will engage more strongly in incremental and radical innovation. This is in contrast to the expectations identified in study 1; that risk-aversion would have a negative moderation effect. It was also found that this moderation effect is stronger for radical innovation than for incremental innovation.

6.2.2. Chapter 5: Combinations of Contracts and Trust in Achieving Innovation (study 4)

Study 4 made use of the necessary condition approach (NCA) to investigate whether and which combinations of contracts, goodwill and competence trust
are critical conditions for innovation by using 48 IORs in the Dutch maintenance sector.

The results showed that contractual detail, goodwill trust, and competence trust are all necessary conditions for incremental innovation; the three conditions (to some extent) must be in place to allow for (a certain level of) innovation. This study also added more detail to the analysis by considering the levels of contractual detail, goodwill trust, and competence trust in combination and identifying the required levels of each of the three conditions given a certain desired level of incremental innovation. The four variables were split into three categories with respect to the observed values of the dependent variable, i.e., low, medium, and high. For each of these degrees, different levels of contracts and trust are necessary. For low levels of incremental innovation, none of the conditions is a bottleneck. Organizations pursuing a medium innovation level will require no to almost half of the maximum level of goodwill trust, no to about two-fifths of the maximum level of competence trust, and very low to about two-fifths of the maximum level of contractual detail. Organizations that aim for high incremental innovation levels need at least two-thirds of the maximum level of goodwill trust, more than half of the maximum level of competence trust, and a minimum of almost half of the maximum level of contractual detail. If any of these levels is not met, this high level of innovation will not be achieved. Note that not meeting the threshold of a condition cannot be compensated by another condition. This study has shown the importance of both governance mechanisms in the pursuit of innovation: neither contracts nor goodwill and competence trust alone are sufficient for high levels of innovation.

In this chapter, we only presented the results for incremental innovation. Nevertheless, appendix F also presents the NCA results for radical innovation. The results seem similar, except that for radical innovation the effect sizes are slightly lower. Hence, goodwill trust, competence trust, and contractual detail
are necessary conditions for incremental and radical innovation. In addition, related to the bottleneck table, for goodwill and competence trust, both innovation types seem to follow a similar pattern; goodwill and competence trust become bottlenecks for medium and high levels of both types of innovation. However, for incremental innovation, contractual detail becomes a bottleneck earlier in the process and with a higher degree compared to radical innovation. This could be explained from the fact that for incremental innovation, a certain degree of contractual detail is necessary whereas for radical innovation, contractual detail should be as low as possible, as showed in study 3.

6.3. An Integrated Perspective

In order to identify how PBCs affect innovation, the first three studies took a step-wise approach by first developing a conceptual model based on an extensive literature review. Second, this model was refined by identifying the mechanisms underlying the hypothesized relationships by means of case studies to understand why certain PBCs are more successful in achieving innovation than others. Figure 6.1 shows the conceptual models and findings of the first three studies. Note that the three models are not exactly the same, either because of new insights (e.g., distinguishing between incremental and radical innovation in the final model) or methodological issues (e.g., in study 3, not measuring the mediating variable of granted autonomy between the relationship of term specificity and innovation, which was identified in study 2).

The studies show that PBCs have two important characteristics: low degree of term specificity and the partner’s reward being linked to its performance. In all three studies these characteristics were linked to innovation. First, it is shown that term specificity has an effect on innovation, albeit in a different way for incremental and radical innovation. For the former at least a certain degree of term specificity is required, whereas for the latter, term
Figure 6.1: Overview of the Three Models in Studies One, Two, and Three
specificity should be as low as possible. This indicates that contracts should not be seen as merely a safeguarding mechanism and a tool to minimize transaction costs. Rather, researchers and practitioners should realize that the way the contract is designed also has an influence on IOR outcomes, specifically innovation. Nevertheless, study 2 showed that focusing only on term specificity (i.e., contract design phase) will not result in innovation. It was proposed that, the granted autonomy given to the partner during the contract execution phase is at least as important. It does not matter whether term specificity is at an optimal degree (to achieve incremental innovation) or very low (to achieve radical innovation), if the autonomy in the contract execution phase is not granted to the partner, they will be inhibited from engaging in innovation.

Furthermore, it was proposed in study 1 and empirically validated in study 3, that paying the partner for the performance it delivers financially stimulates him to engage in both types of innovation. This effect was found to be stronger for radical innovation since the net profits will be higher for such innovations. The entrepreneurship literature states that the ownership of the initiative should be allocated to the entrepreneur in order to provide incentives for innovation. Similarly, there is an incentive to take initiative when the partner is paid for its performance because if the partner accomplishes the contracted performance with fewer than expected resources or better quality, the increased net profits accrue to the partner (Johnson & Medcof, 2007).

Finally, contrary to studies 1 and 2, the empirical results of study 3 show, that under a pay-for-performance clause risk-averseness has a positive effect on both types of innovation. This is opposite to what we expected. This finding may potentially be explained by the high pressure the partner experiences to perform. Sometimes the partner may be forced to engage in pay-for-performance clauses due to the power its customer has, or the importance of the customer to the partner. A pay-for-performance clause is a risky endeavor for risk-averse partners because if the performance is not delivered, the partner
will not be paid. Hence, it is faced with the risk of uncertain income streams. In the situation where the partner is facing a high pay-for-performance clause, it will do its utmost best to assure that it can deliver the performance. In these cases, the partner feels pressure to succeed (i.e., to achieve performance), and it will engage in innovative activities to over-perform just to assure that it can attain the required performance and mitigate the risk of under-performance.

Study 4 took a broader perspective and also acknowledged the role of relational governance in addition to formal governance. In this study, the focus was on contracts in general and not just PBCs. Rather than testing how contracts and trust on average affect innovation (with regression analyses), by using the necessary condition analysis this study researched the combination of contracts and trust which are necessary but not sufficient conditions for a desired level of innovation. When an incomplete contract is implemented, relational governance becomes extremely important. No matter how well the contract is designed, if the relationship between the parties is not good, the IOR will not succeed. The other way around, despite a perfect relationship between the parties, if the contract is badly structured, the IOR will not succeed because the contract does not only serve as a safeguarding mechanism, but the contract also affects outcomes. Overall, despite the fact that scholars have emphasized the role of trust and have questioned the role of detailed contracts, this dissertation shows that contract design in combination with trust is necessary for positive IOR outcomes (specifically for innovation).

6.4. Practical Implications

The findings of this dissertation provide useful guidelines for managers to enhance innovation by means of formal and relational governance structures.

First, as PBCs can be typified by low term specificity and pay-for-performance, this contract type may be effectively used for incremental and
radical innovation, though not simultaneously. For incremental innovation, organizations should design a contract with an optimum degree of term specificity (i.e., not too low, nor too high), and may then add pay-for-performance schemes to counter the opportunism, that may arise because of the certain degree of autonomy the partner deals with. Finding this optimal degree of contractual term specificity requires significant managerial skills. Managers must understand the risks associated with providing the partner too much freedom, as well as the limitations imposed by a contract that is overly detailed. Note however, organizations should keep in mind that designing a contract with the intention of providing autonomy to the partner is not the same as actually granting this autonomy. They should therefore emphasize the contract-execution phase in addition to the contract design phase by providing partner autonomy during the day-to-day operations of the IOR. If e.g., the focal firm is a large and conservative organization, which allows their employees to interfere with the smallest change proposed by the partner, the innovation might be outdated until the time a decision has been made or everybody agrees on a change. Thus, if a focal organization is not open towards granting autonomy or not equipped to implement innovations, it becomes extremely difficult for the partner to undertake and implement innovations. Hence, the culture of the focal firm should be shaped in such a way that it fully supports innovations proposed by the partner.

For radical innovation, pay-for-performance schemes are critical for incentivizing the partner to engage in radical innovation and to counter the opportunism resulting from the lack of contractual constraints needed for this type of innovation.

Moreover, the results show that contrary to what one would expect, when pursuing innovation, organizations should preferably engage in outcome-based reward schemes with a more risk-averse partner, as under conditions of pay-for-performance, risk-averse partners tend to achieve higher levels of
incremental and radical innovation. Hence, organizations should set up a thorough partner evaluation and selection process, which is not based on the lowest cost, but on identifying and selecting those partners that are open towards engaging in new activities and are not too much risk-taking when they have implemented pay-for-performance clauses. Related to the partner selection phase, it is also important that being innovative is something that the partner is comfortable with doing. Though we argue that the contract has a significant effect on whether innovation will take place, some partners are better than others at undertaking innovations. The partner should constantly search for improvement initiatives and innovations for a successful IOR. When organizations decide to use PBCs in their IORs, it is important to not only look at the partner’s risk attitudes, but organizations should also spend a sufficient amount of time in searching and selecting those partners that have the resources, skills and expertise to engage in innovation.

Overall, organizations should emphasize three important stages of engaging in IORs when they want to stimulate innovation: the partner selection phase, the contract design phase, and the contract execution phase. In the partner selection phase, organizations should select partners with a right risk attitude towards engaging in innovation. Hence, there should be a sound partner evaluation and selection process incorporated prior to contracting the partner. Second, in the contract design phase, both parties in the IOR should not consider contracts only as a safeguarding mechanism. Rather, they should realize that the way they structure the contract also has an effect on outcomes such as innovation. Depending on what type of innovation they want to achieve, they should carefully design the term specificity and the partner’s reward scheme. In addition, during the contract design phase, it also becomes important to involve not only legal specialists, because important knowledge regarding roles and responsibilities to include in the contract (i.e., degree of term specificity) often resides outside of the legal department of the firms involved (Argyres & Mayer,
Lawyers are less likely to be a crucial part of the relationships that develop at the operational level, and are thus less likely to have the knowledge possessed by the employees who are involved in the day-to-day operation of the IOR (Argyres & Mayer, 2007). Thus, the parties should also involve employees who will be involved in the day-to-day operations of the IOR. As these employees are in the position to actually grant the autonomy to the partner, they should know how the contract is designed and should live up to what is agreed upon during the contract execution phase.

Finally, organizations should realize that when using incomplete contracts, such as PBCs, they should also incorporate/develop relational governance to achieve innovation. This is because the interplay between formal and relational governance maintains the cooperative performance of the IOR (Huang et al., 2014). Neither of the two governance mechanisms alone is sufficient for high innovation levels. The parties should make sure that there is a good relationship underlying the IOR with a high level of relational attributes such as trust and commitment at strategic-, tactical-, and operational level. It is also important that the formal and informal communication between the parties is set up well, not only to tighten the relationship and increase trust, but also to assure that both organizations know each other’s business so that mutual understanding and knowledge sharing can take place. Depending on the organization’s level of innovation ambition, differing levels of formal governance and relational governance are needed. More specifically, when very high degrees of innovation are ambitioned, both parties should implement very high levels of goodwill trust and competence trust with more than average levels of contractual detail. As long as PBCs are correctly implemented and executed, they provide leeway for innovation provided they are combined with relational attributes and a pro-innovation culture of both parties.
6.5. Theoretical Contributions

This dissertation brings diverse literature streams (i.e., governance, innovation, and supply chain management) together and applies different research methods, all grounded in existing research, to answer the research questions. The contributions and implications for future research to the above mentioned literature streams will be discussed in the below sections. Given that several contributions apply to different literature streams, overlap may exist between the sections.

6.4.1. Inter-Organizational Governance Literature

The studies contribute to the governance literature in several ways. First, current research has emphasized the importance of contracts in IORs and is moving away from focusing on contracts as merely being a safeguard to economic risk to researching how contracts affect coordination and adaptation. Nevertheless, there is a scarcity of research that focuses on performance implications of contracts (Schepker et al., 2014). This dissertation extends prior research on the effects of contracts on performance by showing that an incomplete contract, such as the PBC, has a positive effect on innovation provided that the partner selection, contract design, and contract execution phases are emphasized. Because contracts are often viewed as legal tools to protect the organization, researchers and practitioners may be skeptical in believing that contracts can do more than formally enforce agreements (Schepker et al., 2014). By showing that contracts can have a positive effect on innovation, this dissertation tries to eliminate this skepticism and stimulate future researchers to examine the relationship between contracts and innovation possibly in conjunction with contingency variables such as the partner’s characteristics, or the external- (e.g., market uncertainty) and internal environment (climate for innovation) (Das & Joshi, 2007; Wang et al., 2011). Moreover, future researchers can extend this
line of research by identifying other performance outcomes of contracts (such as satisfaction and performance outcomes).

Furthermore, contrary to existing research, this dissertation adds to the governance literature by combining one of the two most used theories (i.e., TCE and AT) in IOR governance in general, and contracting research in particular. The combined use of these theories provides insights into the relationship between the TCE and AT theories, which are viewed as alternative theories in researching governance, because we show how they can be synergistically combined to increase our theoretical understanding of the relationship between incomplete contracts and innovation. Contract structure and their effects on outcomes cannot be explained by a single theory, additional perspectives are necessary to understand the structure and role of contracts (Schepker et al., 2014). Future research might also use other theoretical perspectives, such as the real options theory and firm capabilities, as a response to the need for contracting research with alternative (combined) theories than e.g., only the TCE (Schepker et al., 2014), because TCE is mainly focused on lowering costs which is not the main focus when aiming for innovation. For example, different firm capabilities, such as learning, technological competences, alliance experience, and contract design capabilities affect contract structures differently, which in turn affects outcomes (Schepker et al., 2014). Having contract design capabilities can become a competitive advantage as an organization becomes better in writing contracts (Mayer & Argyres, 2007). Firms with IOR experience are more likely to achieve greater success in the IOR (Schepker et al., 2014).

Finally, effective IOR governance structures draw on a combination of formal and relational governance mechanisms to take advantage of their different impact they have on outcomes. As concluded in Schepker's et al., (2014) review paper, contractual governance alone is not sufficient for successful IORs. As opposed to existing research, which merely identifies whether contracts and trust are substitutes or complements, study 4 advances the
governance literature by identifying different combinations of contractual detail, goodwill trust, and competence trust, which are required for different levels of innovation. Moreover, by studying the combined effect of two governance mechanisms, study 4 responds to the need of examining (combined) performance implications of alternative governance mechanisms (Schepker et al., 2014). We suggest future researchers to respond to this call and examine performance effects of other governance mechanisms in combination with contracts (such as reputation and network structure), because this dissertation has shown that innovation is dependent not only on the contract but on other governance mechanisms as well. In addition, a methodological contribution is also made in this literature stream as study 4 is one of the few empirical studies investigating necessary conditions in business research in general, and governance literature in particular. Contrary to traditional (variance-based) research methods, the NCA methodology allows to investigate which combinations of conditions are necessary for outcomes.

6.4.2. Innovation Literature

This dissertation extends the innovation literature by providing empirical evidence regarding first, how incomplete contracts, such as PBCs affect innovation and second, which different combinations of contracts and trust are critical for achieving innovation. In line with existing studies which find a positive and inverse-U relationship between contracts and performance (e.g., sales level and return on investment) (Hoetker & Mellewigt, 2009; Luo, 2002), we show that the inverse-U relationship holds for incremental innovation and that for radical innovation little contractual detail is required. The analyses of the studies in this dissertation will help researchers and practitioners to focus on those (characteristics of) governance mechanisms that matter most and adjust these characteristics and investment decisions depending on the degree and type of innovation they want to achieve. As few studies focus on innovation as an
outcome of governance mechanisms, future innovation researchers might extend this line of research by verifying whether our results can be replicated and identifying how other governance mechanisms affect the degree and type of innovation rather than merely focusing on whether governance mechanisms affect innovation or not.

6.4.3. Supply Chain Management Literature

This dissertation has several implications for the supply chain management literature as well. The first three studies considered PBCs as an example of an intentionally left incomplete contract to test its effect on innovation. PBCs are a relatively new way of contracting which is reshaping the support supply chains as it is replacing traditional contracts (i.e., fixed price and cost plus contracts) (Kim et al., 2007). This dissertation contributes to the supply chain management literature by identifying the characteristics and the effects of PBCs which are increasingly being used in the supply chain context. To our knowledge, we are one of the first empirically testing the effects of PBCs on innovation. Future researchers in supply chain management can verify whether our results can be replicated.

In addition, this dissertation shows the importance of the roles of both parties in the IOR (i.e., the buyer and the seller). Unlike traditional contracts where the role of the buyer is underemphasized and a linear and one-directional thinking are used, in IORs which use PBCs, an interactive and multi-dimensional thinking is required where people, resources and knowledge from both parties are implemented (Ng & Nudurupati, 2010). Hence, this dissertation has shown that contracts, such as PBCs, demand changes in the way parties collaborate. For example, when using PBCs, the buyer and supplier are both considered to be co-creators of value and are pushed to become more innovative in value co-creation such as improving the processes and putting in the right culture and resources to make PBCs work (Ng & Nudurupati, 2010). The role of
both parties in the IOR is thus very important when using PBCs. Given the difficulties of value co-creation and a solid relationship required for PBCs, we acknowledge that PBCs are not always successful. It is therefore suggested to extend this line of research and investigate how PBCs can successfully be implemented in buyer-seller relationships to make it a win-win situation.

Finally, suppliers have become an increasingly important source of innovative solutions, ideas, and technologies. Previous studies investigating supplier innovation have mainly focused on the extent of supplier involvement and the dynamics within the collaboration (such as the extent of knowledge exchange). Hardly any studies focus on the design phase of contracting in order to stimulate innovation. This dissertation contributes to the contracting phase of purchasing by emphasizing and showing how contract design stimulates incremental and radical innovation.

### 6.6. Limitations and Future Research Directions

While the studies provide valuable practical and theoretical insights, a few criticisms may be raised. This section will focus on the overall limitations and future research directions of this dissertation.

First, even though the chosen industries (i.e., IT and maintenance) in the empirical studies provide much needed insights to understand the role of formal and relational governance in achieving innovation because these industries are known for the use of PBCs, the generalizability of the results may be limited. To rule out confounding firm and industry effects, study 2 uses a sample of 106 IORs in the Dutch maintenance industry. In addition, study 3 used two case studies in the IT industry only within a single focal firm. In addition, the decision to only focus on the focal organization in study 4 to create a more homogenous group for a relatively new analysis method (i.e., NCA), resulted in a sample of 48 firms in the Dutch maintenance industry only. Therefore, the
findings of these studies may not apply to companies in other industries and geographical areas. Future research should seek to extend this domain to other industries and geographical areas to validate these findings. This would also increase our understanding on the robustness of the results: perhaps high levels of contractual detail are not (so) necessary in countries with cultures that emphasize relationships more strongly than western culture does.

In addition, even though the hypotheses in the studies were embedded in well-established theories, our data is cross-sectional in nature and thus prevented us from strong assumptions about causality. Hence, to fully understand the dynamics of the relationships between contracts, trust, and innovation, future studies could examine the IORs in a longitudinal setting.

Third, as opposed to study 2 where all Venkatraman’s (1994) items were used to measure partner risk-aversion, study 3 considered this construct to be a single-dimensional variable because the pilot study provided bad measurement model results when all (and several) items were taken into consideration. Nevertheless, even though it is in line with existing research that risk-aversion was considered to be a single-dimensional construct, recent studies on the effects of risk preferences in intra-firm settings have unpacked the concept of risk by distinguishing among three elements: the size of the outlay or bet involved in taking a risk, the variance of the potential outcome, and the likelihood of extreme loss (Sanders & Hambrick, 2007). Given that researchers are generally ambiguous about what they exactly mean by risk and risk preference (Sanders & Hambrick, 2007; Wiseman & Gomez-Mejia, 1998), future researchers who study the effects of risk preference on innovation in inter-firm settings, can consider the distinct elements of risk-preference. Doing so would also clarify the risk concept and as such contribute to recent debates on the possible multi-dimensional character of risk. This is especially important because we hypothesize and find (in studies 1 and 2) that the partner’s degree of risk-aversion would hamper innovation, empirical findings in study 3 show the
opposite results. Investigating the risk concept in future research might clarify the results found in this dissertation.

Finally, in addition to methodological limitations, there is also a conceptual issue in contracting research that should not be overlooked. The studies modeled the contract as an antecedent to IOR collaboration because behaviors are usually regarded as consequences of a state, here: the contract. However, future research could be directed at whether and how the collaboration’s history affects contract design and contract execution as this could be one possible explanation for the fact that certain partners are not granted the autonomy in line with the degree of term specificity outlined in the contract. For example, if a focal organization engages in a PBC with a partner with whom they had a very prescriptive contract in previous collaborations (as was shown in study 3, chapter 4). This could imply that, despite the lower term specificity in their new contract, the prescriptive contract of the previous collaboration could still affect the way these parties conduct business.

There are several other interesting future research avenues. First, different research methodologies (i.e., conceptual versus empirical) and different types of data (i.e., archival such as contracts, interviews, and survey questions) were used for the different studies to answer the research questions. For example, in study 4 the NCA approach was used to test the necessity of both governance mechanisms in achieving innovation, whereas study 2 used the traditional regression approach with a larger data set to test the effects of contracts on innovation. Even though the findings provide insights into how organizations can foster innovation by means of contracts and trust in IORs, and the research methods and data are appropriate to address the individual research questions, future research could use the same methodology and data type to verify and validate whether our results hold.

Second, future researchers could test our final proposition in study 2 by investigating whether granted autonomy is indeed a mediating factor in the
relationship between term specificity and innovation. In addition to this, as opposed to the conceptual model, the empirical results show that the partner’s degree of risk-aversion has a positive moderating effect on the relationship between pay-for-performance and innovation. Future researchers could test whether these results hold in their studies as well.

Third, except for the case studies where only two contracts are used, the studies rely on perception measures. Future research could use objective data such as the actual content of the contract and other objective data. Performing in-depth contractual analysis would fit with the call for more research based on contractual content (Chen & Bharadwaj, 2009; Faems et al., 2008).

Finally, the context in which the data were collected was the buyer-seller relationship (i.e., vertical collaboration). However, other collaborations (e.g., horizontal collaborations) are governed in a different way, which might in turn affect innovation differently. In vertical IORs, the focus of the governance is mainly on the coordination of interdependent activities, whereas in horizontal IORs (with competitors) the focus is also on cooperative and competitive behavior (Smets, 2013). In horizontal collaborations, parties in the IOR compete in the same industry for the same resources and knowledge. These exchanged resources and knowledge might be used for competitive rather than cooperative intentions (Ritala & Hurmelinna-Laukkanen, 2013; Sivakumar et al., 2011). One might expect that in such circumstances a more complete contract is written to protect the IOR from such hazards which in turn impedes the partner’s autonomy, resulting in lower innovation. It might be the case that relational governance becomes even more important in such IORs. Future research should investigate how incomplete contracts and trust affect innovation in other IOR types.
6.7. Closing Remarks

This dissertation’s main goals were to identify how the characteristics of incomplete contracts, such as PBCs, affect innovation and which combinations of contracts and trust are critical for innovation in an IOR setting. These issues were addressed in four studies which made use of different research methodologies.

It can be concluded that organizations can use PBCs for a successful collaboration provided that certain conditions are in place. The (performance) goals of both parties should be clearly defined. This is the case because incomplete contracts already contain less detailed clauses related to processes and inputs. If the goals are also not clearly stipulated, it will be even more difficult for the parties to know what the goals are it should adhere to. As a result, ambiguous expectations and misunderstandings will arise, resulting in dissatisfaction from both sides of the IOR. Furthermore, given that the focus of the contract has shifted towards the performance outcomes in PBCs, the focal organization should be less involved in the way the service is delivered. Focal organizations find it extremely difficult to provide autonomy to the partner, they find it difficult to let go of the decision making processes. Nevertheless, it is the partner who has the expertise and knowledge on how to attain the agreed upon performance. The focal organization should be more engaged in managing the IOR rather than interfering in the day-to-day operations of the IOR. In addition, when using PBCs, the risk shifts to the partner since the partner is being paid based on the performance it delivers. As such, both parties should carefully think about how to balance what the focal organization wants (i.e., performance goals), and the payment to the partner for delivering that performance. Finally, IORs in which PBCs are used should emphasize relational governance (i.e., trust) as well. A successful collaboration depends on the use of both governance mechanisms.
As more and more organizations are adopting contracts that are intentionally left incomplete for governing their IORs, an enhanced understanding of how to design, implement, manage, and control such contracts in combination with relational governance is critical. Future research opportunities are abundant, and it is expected that the emerging body of literature on the use and effects of incomplete contracts in general, and PBCs in particular will grow substantially. This dissertation is increases our understanding of how incomplete contracts, such as PBCs, combined with trust affect (incremental and radical) innovation.


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Figure 2.1: Conceptual Model: Relationship between PBCs and Innovation

Chapter 3:
Figure 3.1: Effects of PBCs on Innovation

Chapter 4:
Figure 4.1: Conceptual Model: Relationship between PBC Characteristics and Innovation
Figure 4.2A: Plot of the Moderating Effect of Risk-Aversion on Incremental Innovation
Figure 4.2B: Plot of the Moderating Effect of Risk-Aversion on Radical Innovation

Chapter 5:
Figure 5.1: Scatterplot for Goodwill Trust and Innovation
Figure 5.2: Scatterplot for Competence Trust and Innovation
Figure 5.3: Scatterplot for Contractual Detail and Innovation

Chapter 6:
Figure 6.1: Overview of the Three Models in Studies One, Two and Three
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Chapter 1:
Table 1.1A: Overview of Literature on effects of Contractual and Relational Governance on Performance and Innovation
Table 1.1B: Overview of Literature on effects of Contractual and Relational Governance on Innovation with Effect Sizes
Table 1.2: Outline of the Four Studies in this Dissertation

Chapter 3:
Table 3.1: Main Characteristics of the Inter-Organizational Relationships
Table 3.2: Triangulation
Table 3.3: Data Analysis for Variable Innovation
Table 3.4: Cross-case Results

Chapter 4:
Table 4.1: Descriptive Statistics and Correlation Matrix
Table 4.2: Results
Table 4.3: Summary Results for the Hypothesis Tests

Chapter 5:
Table 5.1: Overview of Literature on effects of Contractual and Relational Governance on Performance and Innovation
Table 5.2: Descriptive Statistics and Pearson Correlation Matrix
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Appendix A2:
Chapter 3: Data analysis of Key Variables Alpha & Kappa

Appendix B:
Chapter 3: Interview and Contract examples

Appendix C:
Chapter 4: Scale Items, Standardized Loadings (SL), T-values, AVE, CR, and Cronbach's Alpha for Granted Autonomy

Appendix D1:
Chapter 4: Scale Items, Standardized Loadings, and T-values (from the Focal Organization, i.e., Buyer)

Appendix D2:
Chapter 4: Questions Asked to the Service Provider (i.e., Supplier)

Appendix E:
Chapter 5: Scale Items, Standardized Loadings, and T-values

Appendix F:
Chapter 5: NCA Results for Radical Innovation (Buying Firm Dataset)
**Appendix A1**: Data Analysis of Key Variables Alpha (Alp) – Sigma (Sig)

(Columns 2-7 concern interviews: STR=strategic; OPE=operational; OVE=overall)

<table>
<thead>
<tr>
<th>Alpha &amp; Sigma</th>
<th>Contract</th>
<th>Alp. STR</th>
<th>Alp. OPE</th>
<th>Alp. OVE</th>
<th>Sig. STR</th>
<th>Sig. OPE</th>
<th>Sig. OVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specificity Level</strong></td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>-Timeframe for completion of each stage is specified</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-Number of employees to be contributed is specified</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-Specific persons stipulated for management or other development work is specified</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-Specific technologies to be contributed are specified</td>
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<tr>
<td>-Development specifications are included</td>
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<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-How to perform the tasks is stipulated</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-Intellectual property rights are defined over specific technologies</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Pay- for - Performance</strong></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier's rewards are linked to outcomes of the service</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier has sufficient financial incentives to improve/innovate the service</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier is compensated for a better quality or delivery of the service</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier's rewards are linked to improving the performance</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-We have agreed upon performance bonuses on top of the regular payment schemes when higher-level performance goals are over-achieved</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
- The supplier is (financially) rewarded for new ways of achieving performance
  
  |  |  |  |  | Y | Y | Y | Y | Y | Y | Y |

### Risk Aversion

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
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<tbody>
<tr>
<td>- The supplier adopts a conservative view when making major decisions</td>
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<td>N</td>
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</tr>
<tr>
<td>- The supplier has a tendency to support projects where the expected returns are certain</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- The supplier's operations have generally followed the 'tried and true' paths</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- The supplier's operations can generally be characterized as high risk *</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>N</td>
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</tr>
<tr>
<td>- The supplier's new projects are approved on a stage-by-stage basis rather than with 'blanket' approval</td>
<td>N</td>
<td>N</td>
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### Innovation

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<th>Y</th>
<th>Y</th>
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<tbody>
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<td>N</td>
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<tr>
<td>- A new way of interacting with the client</td>
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<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>- A new/changed internal organizational arrangements to allow service workers to perform their job properly</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
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</tr>
<tr>
<td>- A new product/technology Faster service delivery</td>
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<tr>
<td>- Cheaper way of delivering the service</td>
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<tr>
<td>- Better quality of the service</td>
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**Appendix A2:** Data Analysis of Key Variables Alpha (Alp) – Kappa (Kap)
(COLUMNS 2-4 CONCERN THE INTERVIEWS: STR=STRATEGIC; OPE=OPERATIONAL; OVE=OVERALL)

<table>
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<th>Contract</th>
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<th>Alp. OPE</th>
<th>Alp. OVE</th>
<th>Kap. OPE</th>
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<tbody>
<tr>
<td>Specificity Level</td>
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<tr>
<td>-Timeframe for completion of each stage is specified</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
</tr>
<tr>
<td>-Number of employees to be contributed is specified</td>
<td>N</td>
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<tr>
<td>-Specific technologies to be contributed is specified</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
</tr>
<tr>
<td>-Development specifications are included</td>
<td>N</td>
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<td>N</td>
</tr>
<tr>
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<td>N</td>
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<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>-Intellectual property rights are defined over specific technologies</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Pay- for - Performance</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier's rewards are linked to outcomes of the service</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier has sufficient financial incentives to improve/innovate the service</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>-The supplier is compensated for a better quality or delivery of the service</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier's rewards are linked to improving the performance</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-We have agreed upon performance bonuses on top of the regular payment schemes when higher-level performance goals are over-achieved</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>-The supplier is (financially) rewarded for new ways of achieving performance</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Risk Aversion</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>High</td>
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<tr>
<td>-The supplier adopts a conservative view when making major decisions</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>-The supplier has a tendency to support projects where the expected returns are certain</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>-The supplier's operations have generally followed the 'tried and true' paths</td>
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<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>-The supplier's operations can generally be characterized as high risk *</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>
- The supplier's new projects are approved on a stage-by-stage basis rather than with 'blanket' approval.

<table>
<thead>
<tr>
<th>Innovation</th>
<th>N</th>
<th>N</th>
<th>N</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A creation of a new service within a particular market</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- A new way of interacting with the client</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- A new/changed internal organizational arrangements to allow service workers to perform their job properly</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- A new product/technology</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- Faster service delivery</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- Cheaper way of delivering the service</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>- Better quality of the service</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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</table>
Appendix B: Interview and Contract Examples

<table>
<thead>
<tr>
<th>Coding Variable</th>
<th>Interview and/or Contract Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term Specificity</td>
<td>Interview Alpha &amp; Kappa: “Kappa decides how to deliver the services or which resources it should use … Alpha decides the IT enterprise architecture. … Alpha does not tell us [Kappa] how we should deliver the service.”</td>
</tr>
<tr>
<td></td>
<td>Contract Alpha &amp; Sigma: “The partner delivers the service according to the quality specified in this agreement and the corresponding appendices. This is a performance obligation …. They take the operational responsibility for 100% functional uptime, integration with the application partners and the technical and organizational interfaces, and overall 100% availability and control.”</td>
</tr>
<tr>
<td>Pay-for-Performance</td>
<td>Contract Alpha &amp; Sigma: “Alpha shall pay Sigma the monthly recurring charges as mentioned in the cost-model. These are in turn tied to performance: If Sigma does not meet the performance goal, than Alpha is entitled to claim service credits irrespective of the cause of the downtime.”</td>
</tr>
<tr>
<td>Innovation</td>
<td>Interview Alpha &amp; Sigma: “Sigma has incorporated a dashboard that allows Asset Management to keep an eye on the functionality/availability of the applications. Asset managers can now directly monitor the IT infrastructure instead of waiting for Sigma to announce that something is wrong.”</td>
</tr>
<tr>
<td></td>
<td>Interview Alpha &amp; Kappa: “… there is a limit on the degree to which Kappa can deviate from the boundary conditions [set by Alpha’s enterprise architects], and the openness of Alpha’s architects to deviations from the IT enterprise architecture is limited … which has certain implications for Kappa’s innovative activities.”</td>
</tr>
<tr>
<td>Partner Risk Aversion</td>
<td>Interview Alpha &amp; Sigma: “Because our risk management is controlled tightly, we can handle risk because we know what we are doing.”</td>
</tr>
<tr>
<td></td>
<td>Interview Alpha &amp; Kappa: “Kappa is protective of their investments and seeks to maintain volume rather than to increase margins via improved service delivery.”</td>
</tr>
</tbody>
</table>
**Appendix C**: Scale Items, Standardized Loadings (SL), T-values, AVE, CR, and Cronbach’s Alpha for Granted Autonomy

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Loadings</th>
<th>T-values</th>
<th>Granted Autonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The partner is allowed to make its own decisions concerning the service most of the time</td>
<td>0.665</td>
<td>2.413</td>
<td></td>
</tr>
<tr>
<td>2. We trust the partner to take decisions regarding the service delivery without our permission first</td>
<td>0.679</td>
<td>4.031</td>
<td></td>
</tr>
<tr>
<td>3. We tightly control the partner's work concerning the service they deliver*</td>
<td>0.000</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>4. It is important that the partner checks things first with us before taking a decision concerning the service*</td>
<td>0.244</td>
<td>1.062</td>
<td></td>
</tr>
<tr>
<td>5. We keep too tight a reign on the way things are done concerning the service*</td>
<td>0.112</td>
<td>0.445</td>
<td></td>
</tr>
</tbody>
</table>

Average Variance Extracted (AVE) 0.195
Composite Reliability (CR) 0.195
Cronbach’s Alpha 0.586

N_Total= 106
**Appendix D1**: Scale Items, Standardized Loadings (SL), and T-values (t) taken from the Focal Organization (i.e., Buying Organization)

<table>
<thead>
<tr>
<th>Incremental Innovation (Likert-scale = 1 to 5)</th>
<th>SL</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent do you agree with the statements below regarding the activities that have been carried out by the partner within this maintenance contract?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The partner continuously improves the maintenance processes</td>
<td>0.81</td>
<td>42.39</td>
</tr>
<tr>
<td>2. The partner often refines the delivery of existing products and services</td>
<td>0.86</td>
<td>56.62</td>
</tr>
<tr>
<td>3. The partner regularly implements small adjustments to existing products and services</td>
<td>0.87</td>
<td>50.98</td>
</tr>
<tr>
<td>4. The partner improves the efficiency of the products and services that are delivered</td>
<td>0.92</td>
<td>91.81</td>
</tr>
<tr>
<td>5. The partner contributes to a higher degree of usage and effectiveness of the asset</td>
<td>0.79</td>
<td>28.37</td>
</tr>
<tr>
<td>6. The partner improves scope management</td>
<td>0.86</td>
<td>43.06</td>
</tr>
<tr>
<td>7. The partner achieves a higher productivity from the mechanics</td>
<td>0.75</td>
<td>22.88</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Radical Innovation (Likert-scale = 1 to 5)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent do you agree with the statements below regarding the activities that have been carried out by the partner within this maintenance contract?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Creation of a new service within a particular market</td>
<td>0.84</td>
<td>47.47</td>
</tr>
<tr>
<td>2. New way of interacting with the client who receives the service</td>
<td>0.86</td>
<td>50.59</td>
</tr>
<tr>
<td>3. Changed internal organizational arrangements with the partner to allow their employees to perform their job properly</td>
<td>0.81</td>
<td>27.13</td>
</tr>
<tr>
<td>4. Change in the tangible aspects of the transaction (e.g., new/changed technology)</td>
<td>0.80</td>
<td>23.77</td>
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</table>

<table>
<thead>
<tr>
<th>Term Specificity (Likert-scale = 1 to 7)</th>
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</thead>
<tbody>
<tr>
<td>To what extent are the following specifications outlined in this maintenance contract?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The specific persons to be assigned the management and monitoring tasks</td>
<td>0.74</td>
<td>22.46</td>
</tr>
<tr>
<td>2. The specific resources the partner should use</td>
<td>0.72</td>
<td>15.82</td>
</tr>
<tr>
<td>3. How the partner should develop certain resources/technologies</td>
<td>0.88</td>
<td>65.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pay-for-performance (Likert-scale = 1 to 7)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent do you agree with the following statements regarding the reward schemes applied in this contract?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The partner’s rewards are linked to the outcomes of the service delivered</td>
<td>0.65</td>
<td>13.27</td>
</tr>
<tr>
<td>2. The partner has sufficient financial incentives to improve/develop the service</td>
<td>0.76</td>
<td>24.70</td>
</tr>
<tr>
<td>3. The partner is compensated for delivering better service quality</td>
<td>0.79</td>
<td>23.67</td>
</tr>
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</table>
4. The partner’s rewards are linked to the degree of improvement in its performance
5. We have agreed-upon performance bonuses on top of the regular payment schemes when performance levels exceed targets
6. The partner is financially rewarded for developing alternative/new ways of achieving the performance targets

<table>
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<tr>
<th>Trust (Likert-scale = 1 to 5)</th>
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<tbody>
<tr>
<td>To what extent do you agree with the following statements regarding the degree of trust between your company and the partner?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Our relationship with this partner is characterized by high levels of trust</td>
<td>0.75</td>
<td>18.02</td>
</tr>
<tr>
<td>2. The parties generally trust that each will stay within the terms of the contract</td>
<td>0.76</td>
<td>23.36</td>
</tr>
<tr>
<td>3. The parties are generally skeptical of the information provided by the other [R]</td>
<td>0.65</td>
<td>12.37</td>
</tr>
<tr>
<td>4. The parties trust each other to have the required resources (such as capital and labor)</td>
<td>0.78</td>
<td>29.78</td>
</tr>
<tr>
<td>5. The parties acknowledge each other’s reputation and capabilities</td>
<td>0.70</td>
<td>15.73</td>
</tr>
<tr>
<td>6. The parties do whatever is necessary to ensure the success of the collaboration even if it involves performing tasks that they had not previously agreed on</td>
<td>0.77</td>
<td>26.23</td>
</tr>
<tr>
<td>7. Neither partywithholds information that is needed to perform well</td>
<td>0.72</td>
<td>19.06</td>
</tr>
<tr>
<td>8. Neither party exploits to its advantage any (temporary) shortcomings of the other party</td>
<td>0.73</td>
<td>16.90</td>
</tr>
<tr>
<td>9. The parties work hard to help each other solve problems that may influence the success of the collaboration</td>
<td>0.84</td>
<td>39.73</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk-Aversion of the Partner</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent do you agree with the following statements regarding the partner’s predisposition toward risk?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The partner prefers the “tried and true” paths</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transactional Complexity</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How would you evaluate the complexity of the products and services delivered by the partner within this maintenance contract (from very low to very high)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D2: Questions Asked to the Service Provider (i.e., Supplier)

**Incremental Innovation** (Likert-scale = 1 to 5)

*To what extent do you agree with the statements below regarding the activities that have been carried out by your company within this maintenance contract?*

1. Our company continuously improves the maintenance processes
2. Our company often refines the delivery of existing products and services
3. Our company regularly implements small adjustments to existing products and services
4. Our company improves the efficiency of the products and services that are delivered
5. Our company contributes to a higher degree of usage and effectiveness of the asset
6. Our company improves scope management
7. Our company achieves a higher productivity from the mechanics

**Radical Innovation** (Likert-scale = 1 to 5)

*To what extent do you agree with the statements below regarding the activities that have been carried out by your company within this maintenance contract?*

1. Creation of a new service within a particular market
2. New way of interacting with the client who receives the service
3. Changing our internal organizational arrangements to allow our employees to perform their job properly
4. Change in the tangible aspects of the transaction (e.g., new/changed technology)

**Term Specificity** (Likert-scale = 1 to 7)

*To what extent are the following specifications outlined in this maintenance contract?*

1. The specific persons to be assigned the management and monitoring tasks
2. The specific resources to our company should use
3. How our company should develop certain resources/technologies

**Pay-for-performance** (Likert-scale = 1 to 7)

*To what extent do you agree with the following statements regarding the reward schemes applied in this contract?*

1. Our company’s rewards are linked to the outcomes of the service delivered
2. Our company has sufficient financial incentives to improve/develop the service
3. Our company is compensated for delivering better service quality
4. Our company’s rewards are linked to the degree of improvement in the performance we deliver
5. We have agreed-upon performance bonuses on top of the regular payment schemes when performance levels exceed targets
6. Our company is financially rewarded for developing alternative/new ways of achieving the performance targets

**Trust** (Likert-scale = 1 to 5)
To what extent do you agree with the following statements regarding the degree of trust between your company and the client?

1. Our relationship with this client is characterized by high levels of trust
2. The parties generally trust that each will stay within the terms of the contract
3. The parties are generally skeptical of the information provided by the other [R]
4. The parties trust each other to have the required resources (such as capital and labor)
5. The parties acknowledge each other’s reputation and capabilities
6. The parties do whatever is necessary to ensure the success of the collaboration even if it involves performing tasks that they had not previously agreed on
7. The parties will not withhold any information that each party needs to perform well
8. Neither party exploits to its advantage any (temporary) shortcomings of the other party
9. The parties work hard to help each other solve problems that may influence the success of the collaboration

**Risk-Aversion of the Partner**

To what extent do you agree with the following statements regarding your company’s predisposition toward risk?

1. Our company prefers the “tried and true” paths

**Transactional Complexity**

1. How would you evaluate the complexity of the products and services delivered by your company within this maintenance contract (from very low to very high)?
### Appendix E: Scale Items, Standardized Loadings (SL), and T-values (t)

#### Incremental Innovation (Likert-scale = 1 to 5)

*To what extent do you agree with the statements below regarding the activities that have been carried out by the partner within this maintenance contract?*

<table>
<thead>
<tr>
<th>Item</th>
<th>SL</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The partner continuously improves the maintenance processes</td>
<td>0.79</td>
<td>33.06</td>
</tr>
<tr>
<td>2. The partner often refines the delivery of existing products and</td>
<td>0.83</td>
<td>37.53</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The partner regularly implements small adjustments to existing</td>
<td>0.85</td>
<td>52.97</td>
</tr>
<tr>
<td>products and services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The partner improves the efficiency of the products and services</td>
<td>0.91</td>
<td>87.86</td>
</tr>
<tr>
<td>that are delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The partner contributes to a higher degree of usage and</td>
<td>0.78</td>
<td>35.13</td>
</tr>
<tr>
<td>effectiveness of the asset</td>
<td>0.86</td>
<td>43.87</td>
</tr>
<tr>
<td>6. The partner improves scope management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The partner achieves a higher productivity from the mechanics</td>
<td>0.72</td>
<td>19.61</td>
</tr>
</tbody>
</table>

#### Goodwill Trust (Likert-scale = 1 to 5)

*To what extent do you agree with the following statements regarding the degree of trust between your company and the supplier’s:*

<table>
<thead>
<tr>
<th>Item</th>
<th>SL</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Our relationship with this partner is characterized by high levels</td>
<td>0.81</td>
<td>29.99</td>
</tr>
<tr>
<td>of trust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The parties generally trust that each will stay within the terms</td>
<td>0.78</td>
<td>21.58</td>
</tr>
<tr>
<td>of the contract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The parties are generally skeptical of the information provided</td>
<td>0.78</td>
<td>28.73</td>
</tr>
<tr>
<td>to each other [R]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The parties do whatever is necessary to ensure the success of</td>
<td>0.76</td>
<td>25.69</td>
</tr>
<tr>
<td>the collaboration even if it involves performing tasks that they</td>
<td></td>
<td></td>
</tr>
<tr>
<td>had not previously agreed on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The parties will not withhold any information that each party</td>
<td>0.66</td>
<td>11.01</td>
</tr>
<tr>
<td>needs to perform well</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Neither party exploits to its advantage any (temporary)</td>
<td>0.68</td>
<td>11.33</td>
</tr>
<tr>
<td>shortcomings of the other party</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The parties work hard to help each other solve problems that</td>
<td>0.81</td>
<td>25.77</td>
</tr>
<tr>
<td>may influence the success of the collaboration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Competence Trust (Likert-scale = 1 to 5)

*To what extent do you agree with the following statements regarding the degree of trust between your company and the supplier’s:*

<table>
<thead>
<tr>
<th>Item</th>
<th>SL</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The parties trust each other to have the required resources</td>
<td>0.92</td>
<td>68.79</td>
</tr>
<tr>
<td>(such as capital and labor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The parties acknowledge each other’s reputation and abilities</td>
<td>0.82</td>
<td>32.57</td>
</tr>
</tbody>
</table>

#### Contractual detail (formative construct, Likert-scale = 1 to 7)

*To what extent are the following specifications outlined in this maintenance contract:*
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Timeframe for completion of each stage is specified</td>
</tr>
<tr>
<td>2.</td>
<td>Number of employees contributed by the supplier</td>
</tr>
<tr>
<td>3.</td>
<td>The specific persons to be assigned the management and monitoring tasks</td>
</tr>
<tr>
<td>4.</td>
<td>The specific resources the partner should use</td>
</tr>
<tr>
<td>5.</td>
<td>How the partner should develop certain resources/technologies</td>
</tr>
<tr>
<td>6.</td>
<td>How the partner should carry out their duties and activities</td>
</tr>
<tr>
<td>7.</td>
<td>The freedom to adapt to unforeseen circumstances in the way the partner thinks best</td>
</tr>
</tbody>
</table>
Appendix F: NCA Results for Radical Innovation (Buying Firm Dataset)

Descriptive Statistics and Pearson Correlation Matrix Radical Innovation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Empirical Min.-Max.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Radical Innovation</td>
<td>2.84</td>
<td>4-20</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Contractual detail</td>
<td>3.51</td>
<td>13-40</td>
<td>2</td>
<td>.7</td>
<td>.45</td>
<td>1</td>
</tr>
<tr>
<td>3. Goodwill Trust</td>
<td>3.85</td>
<td>17-35</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Competence Trust</td>
<td>4.10</td>
<td>6-10</td>
<td>2</td>
<td>.13</td>
<td>.29</td>
<td>.73</td>
</tr>
</tbody>
</table>

Cronbach’s Alpha         | -    |                    | .89  | -  | .88  | .70  |
Composite Reliability    | -    |                    | .92  | -  | .90  | .72  |
Average Variance Extracted (AVE) | -   |                   | .75  | -  | .57  | .60  |

N= 48

Results of NCA using Ceiling Regression for Radical Innovation

<table>
<thead>
<tr>
<th>Construct</th>
<th>Method</th>
<th>Accuracy</th>
<th>Ceiling zone</th>
<th>Scope</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1-Goodwill trust</td>
<td>CE-FDH</td>
<td>100%</td>
<td>70.00</td>
<td>288</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>CR-FDH</td>
<td>90%</td>
<td>57.00</td>
<td>288</td>
<td>0.20</td>
</tr>
<tr>
<td>H2-Competence trust</td>
<td>CE-FDH</td>
<td>100%</td>
<td>15.00</td>
<td>64</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>CR-FDH</td>
<td>94%</td>
<td>11.02</td>
<td>64</td>
<td>0.17</td>
</tr>
<tr>
<td>H3-Contractual detail</td>
<td>CE-FDH</td>
<td>100%</td>
<td>75.00</td>
<td>432</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>CR-FDH</td>
<td>94%</td>
<td>64.75</td>
<td>432</td>
<td>0.15</td>
</tr>
</tbody>
</table>
Scatterplot for Goodwill Trust and Radical Innovation (y=9.53656+0.2806452x)

Scatterplot for Competence Trust and Radical Innovation (y=5.25+1.5x)
Scatterplot for Contractual Detail and Radical Innovation ($y=8.098464+0.3775971x$)

Table 5.4: Bottleneck Levels (in %) using Ceiling Regression (NA= no bottleneck)

<table>
<thead>
<tr>
<th>Radical Innovation</th>
<th>Goodwill trust</th>
<th>Competence trust</th>
<th>Contractual detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>10</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>20</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>30</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>40</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>50</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>55</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>60</td>
<td>NA</td>
<td>NA</td>
<td>5.81</td>
</tr>
<tr>
<td>65</td>
<td>1.83</td>
<td>2.50</td>
<td>13.66</td>
</tr>
<tr>
<td>70</td>
<td>17.67</td>
<td>15.83</td>
<td>21.51</td>
</tr>
<tr>
<td>75</td>
<td>33.5</td>
<td>29.17</td>
<td>29.35</td>
</tr>
<tr>
<td>80</td>
<td>49.34</td>
<td>42.50</td>
<td>37.20</td>
</tr>
<tr>
<td>85</td>
<td>65.18</td>
<td>55.83</td>
<td>45.05</td>
</tr>
<tr>
<td>90</td>
<td>81.01</td>
<td>69.17</td>
<td>52.9</td>
</tr>
<tr>
<td>95</td>
<td>96.85</td>
<td>82.5</td>
<td>60.74</td>
</tr>
<tr>
<td>100</td>
<td>100.00</td>
<td>95.83</td>
<td>68.59</td>
</tr>
</tbody>
</table>
Summary

Although studies have shown that inter-organizational relationships (IORs) enhance and even drive innovation, according to transaction cost economics (TCE) and agency theory (AT), the IOR may suffer from opportunistic behavior or coordination failures that impede the efforts of even well-intentioned parties. Formal governance (i.e., contracts) and relational governance (i.e., trust) are both viewed as important governance mechanisms that safeguard IORs from opportunistic behavior and failures. However, compared to relational governance, there is scarce research on the effects of contracts on innovation.

Nevertheless, researchers do agree on and have suggested that performance-based contracts (PBCs), which have intentionally been left incomplete and are predominantly used in the context of partnering with an organization that delivers services, allows room for the partner to engage in innovation. PBCs are contracts that underline the outcome of the transaction rather than prescribing how to perform the transaction or which resources to use. Though several authors have acknowledged the positive effects of such contracts on innovation, none of the research empirically studies how this effect occurs. Moreover, studies rarely link contracts to positive performance outcomes. Thus, the question of how (incomplete) contracts, such as PBCs, affect innovation in inter-firm settings is insufficiently answered. This dissertation contributes to this debate by focusing on PBCs as a specific type of incomplete contract and develops and empirically tests a conceptual model that explains how the characteristics of PBCs affect innovation. In addition, despite the increasing importance of relational governance in IORs when using incomplete contracts and the large amount of research on contracts and trust, there is little consensus on the relationship between trust, contracts, and innovation. More specifically, contracts and trust have not been viewed in terms of their necessity, i.e., are they both necessary, but not sufficient, conditions for
innovation, and in which combinations are they necessary for certain degrees of innovation. Therefore, this dissertation presents four studies on how to successfully engage in innovation by using formal and relational governance mechanisms. The research questions of this dissertation were formulated as:

**Research Question 1:** To what extent do PBCs affect innovation in IORs?

  **Research Question 1A:** What are the main characteristics of PBCs?

  **Research Question 1B:** How can the relationship between PBCs and innovation in IORs theoretically be explained?

  **Research Question 1C:** How can the relationship between PBCs and innovation in IORs empirically be explained?

**Research Question 2:** Which combinations of contracts and trust are necessary for achieving innovation in IORs?

Given that existing research has not focused on the effects of PBCs on innovation, it was necessary to build a preliminary conceptual model that shows how existing governance, management and innovation literature and theories could explain the relationship between incomplete contracts, such as PBCs, and innovation. Hence, the first study’s (chapter 2) objective was to identify the key characteristics of PBCs and develop a conceptual model that identifies how existing literature and theories can explain the relationship between these characteristics and innovation by means of an extensive literature review.

The study showed that PBCs are characterized by *low term specificity* in comparison to behavior-based contracts, which prescribe the resources and the delivery. Second, PBCs reward the partner for its performance (*pay-for-performance*). TCE and AT were then used to explain how these contractual characteristics affect innovation. TCE proposes that the IOR can be protected from opportunism by the degree of contractual completeness, and AT focuses on the way the partner is rewarded. TCE suggests that low term specificity gives
the partner the autonomy to decide how to attain the performance goals, and control over the processes and procedures of their own work, which in turn results in innovative activities. However, excessive low term specificity creates the potential for the partner to act opportunistically, resulting in an overall lower quality and value of the innovative activities. Moreover, it was also argued that a too high degree of term specificity is detrimental for innovation. Furthermore, it was argued that when the partner is paid for performance, it is incentivized to behave in the interest of the focal firm and engage in innovation activities. Thus linking rewards to performance positively affects innovation. Finally, it was postulated that, all else being equal, the more a risk-averse the partner, the less it will engage in innovative activities as the partner will be less sensitive to the pay-for-performance clause.

In addition, to empirically refine the conceptual model study 2 (chapter 3) made use of two cases of performance-based IT-service contracts. The most important finding of this study was related to term specificity. It was observed that low term specificity in the contractual design phase which should provide autonomy is not sufficient for innovation: it appears to be the granted autonomy that allows the partner to use their knowledge and experience to optimize the service process. Thus, even though existing theory argues that a low degree of term specificity provides autonomy to engage in innovative activities, if the spirit of the contract is not followed and the focal organization does not provide this autonomy, innovation will not occur.

To answer the main research question, study three (chapter 4) empirically tested the relationship between the characteristics of PBCs and incremental and radical innovation by means of a survey-based research approach, whereby data was collected from 106 buying and selling organizations active in the Dutch maintenance industry.

The results show that term specificity affects incremental and radical innovation differently. Term specificity is inverse-U related to incremental
innovation, meaning that term specificity should neither be too high nor too low to achieve the highest possible level of incremental innovation. On the other hand, this effect was not found for radical innovation. Rather, term specificity negatively affects radical innovation. Second, the results showed that pay-for-performance positively affects both incremental and radical innovation. Moreover, the effect of pay-for-performance was found to be stronger for radical innovation than for incremental innovation. Third, it was found that the partner’s degree of risk-aversion positively rather than negatively moderates the relationship between pay-for-performance and incremental and radical innovation. This means that under pay-for-performance conditions, a risk-averse partner will engage more strongly in incremental and radical innovation. This is in contrast to the expectations identified in studies 1 and 2 that risk-aversion would have a negative moderation effect. This finding may be explained from the relatively higher pressure that risk-averse partners compared to non risk-averse partners experience under the presence of a pay-for-performance clause. Under such conditions, risk-averse partners will experience pressure to succeed, because the consequences of not meeting performance targets could have serious financial consequences. Such pressure drives organizations to place a greater value on creative ideas and, thus, to act on the outcomes of a creative climate. As a result, risk-averse partners will deploy more conscious decision-making and devote their most valuable resources to offset the risks they are confronted with and to obtain the rewards involved. It was also found that this moderation effect is stronger for radical innovation than for incremental innovation.

The final research question of which combinations of contracts and trust are necessary for achieving a certain degree of innovation was answered in study 4 (chapter 5) by using the necessary condition approach (NCA) to analyze data on 48 IORs in the Dutch maintenance sector. The results showed that contractual detail, goodwill trust, and competence trust are all necessary
conditions for innovation; the three conditions (to some extent) must be in place to even allow for (a certain level of) innovation. The findings suggest that contracts and trust are complements in explaining innovation. This study also added more detail to the analysis by considering the levels of contracts, goodwill trust, and competence trust in combination and identifying the required levels of each of the three conditions given a certain desired level of innovation. The four variables were split into three categories, i.e., low, medium, and high. For low levels of innovation, none of the conditions is a bottleneck. Organizations pursuing a medium innovation require no to almost half of the maximum level of goodwill trust, no to about two-fifths of the maximum level of competence trust, and very low to about two-fifths of the maximum level of contractual detail. Organizations that aim for high innovation levels need at least two-thirds of the maximum level of goodwill trust, at least more than half of the maximum level of competence trust, and at least almost half of the maximum level of contractual detail. If any of these levels is not met, this high level of innovation will not be achieved. Note that not meeting the threshold of a condition cannot be compensated by another condition.

Finally, chapter 6 summarized the main findings of the four studies and provided an integrated perspective by showing the commonalities between the separate studies. It also showed the practical implications of this dissertation. Overall, the first three studies showed the importance of three stages of engaging in IORs when organizations want to stimulate innovation: the partner selection phase, the contract design phase, and the contract execution phase. In the partner selection phase, organizations should select those partners according to their risk-preference in terms of engaging in innovation when a pay-for-performance clause is present. Hence, there should be a sound partner evaluation and selection process incorporated prior to contracting the partner. Second, in the contract design phase, both parties in the IOR should not consider contracts only as a safeguarding mechanism. Rather, they should realize that the way they
structure the contract also has an effect on outcomes such as innovation. Depending on what type of innovation they want to achieve, they should carefully design the term specificity and the partner’s reward scheme. In addition, it also becomes important to involve not only legal employees during the contract design phase because important knowledge regarding roles and responsibilities to include in the contract (i.e., degree of term specificity) often resides outside of the legal department of the firms involved (Argyres & Mayer, 2007). Lawyers are less likely to be a crucial part of the relationships that develop at the operating level, and are thus less likely to have the knowledge possessed by the employees who are involved in the day-to-day operation of the IOR (Argyres & Mayer, 2007). The parties should also involve employees who will be involved in the day-to-day operations of the IOR. This dissertation also acknowledged the role of relational governance. It showed the importance of contracts and trust in achieving high levels of innovation. When an incomplete contract is implemented, relational governance becomes extremely important.

In sum, this dissertation has provided empirical evidence for the importance of formal and relational governance mechanisms in IORs. The studies have shown that formal governance is no longer seen as only mitigating risks that accompany IORs. Rather, despite the fact that scholars have emphasized the role of trust and have questioned the role of contracts, this dissertation shows that contract design and contract execution in combination with trust has a significant effect on IOR outcomes. Hence, there is an important task for managers to make the trade-off between more or less contractual detail, goodwill trust and competence trust for achieving innovation. Depending on their level of ambition and which type of innovation (i.e., incremental or radical) they want to pursue, they have to carefully optimize their formal and relational governance mechanism, since different level and type of innovation require different levels of contractual detail and trust.
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