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Governing Collaborative New Product Development: Toward a Configurational Perspective on the Role of Contracts*

Erwin Hofman , Dries Faems , and Stephanie C. Schleimer

This study inductively explores the interplay among different contractual functions and their impact on project performance in collaborative new product development (NPD) projects. Applying a configurational perspective, contracts are conceptualized as bundles of different functions. In line with the notion of discriminating alignment, an explicit distinction is made between different contextual settings in terms of innovation objectives (i.e., incremental versus radical) and relational embeddedness (i.e., presence versus absence of prior collaboration) in the exploration of the project performance implications of different contractual configurations. Fuzzy set qualitative comparative analyses on a sample of 125 collaborative NPD projects helped to generate propositions on the interplay between different contractual functions across different contextual settings. The results indicate that the contractual coordination function is an important function in achieving high project performance in collaborative NPD projects. However, the research findings demonstrate that it is not a sufficient condition and needs to be complemented with discrete safeguarding functions depending on the particular context. Together, these findings provide new insights into how particular combinations of contractual functions can help address the core governance challenges of collaborative NPD. They also point to the relevance of applying a configurational perspective to the study of the role of contracts in management research. Finally, they provide practitioners with specific recommendations concerning the design of contracts for collaborative NPD projects.

Practitioner Points

- Managers of collaborative NPD have greater flexibility in designing high-performing contracts than commonly depicted in earlier studies. Results indicate that, within the same NPD context, high performance can sometimes be reached using rather different combinations of contractual functions.
- Our findings stress the importance of contractual coordination for collaborative NPD. However,

managers should complement coordination functions with safeguarding provisions in order to procure high-performing contract designs.

- Collaborative NPD projects are embedded in particular settings, generating specific governance challenges that require diverse combinations of different contractual functions.

Introduction

Collaborative new product development (NPD) has been identified as a valuable strategy to complement the internal innovation efforts of firms (e.g., Belderbos, Carree, and Lokshin, 2004; Faems, Van Looy, and Debackere, 2005; Hu, McNamara, and Piaskowska, 2017). At the same time, it triggers important governance challenges. Research on the governance of NPD projects (e.g., Bstieler and Hemmert, 2010; Gerwin, 2004; Gnyawali and Park, 2011) points to the mitigation of opportunistic behavior and the reduction of coordination gaps as two core issues in this regard. In the governance literature, contracts—i.e., “agreements in writing between two or more parties, which are perceived as legally binding”

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(Lyons and Mehta, 1997, p. 241)—are identified as valuable structural mechanisms to address these challenges (Salvato, Reuer, and Battigalli, 2017; Schepker, Oh, Martynov, and Poppo, 2014). Some scholars (e.g., Dwyer and Oh, 1988; Klein, Crawford, and Alchian, 1978; Parkhe, 1993) stress that contracts have an important safeguarding function. Specifically, partners can codify particular provisions in contracts that reduce the risk of opportunistic behavior. Others (e.g., Mayer and Argyres, 2004; Parkhe, 1993; Reuer and Ariño, 2007; Ryall and Sampson, 2009) emphasize that contracts can have a coordination function since partners can formulate contractual provisions that formalize coordinated action among collaborating partners.

Although scholars have identified different potential governance functions of contracts, the interplay among them has not been given due attention. This is an important research gap since, in the particular context of collaborative NPD projects, extant research would seem to provide opposing views on the added value of combining both safeguarding and coordination functions in contracts for collaborative R&D. Whereas Faems, Janssens, Madhok, and Van Looy (2008) point

to the possibility of synergistically combining different contractual functions for collaborative NPD, other studies (Smets, Langerak, and Tatikonda, 2016; Walter, Walter, and Müller, 2015) appear to suggest that such combinations may lead to excessive formalization, thereby hampering the successful implementation of joint NPD activities. These different arguments point to the need for a more in-depth exploration of the interplay among the different contractual governance functions and the consequent impact on collaborative NPD projects, which is the core focus of this article.

A core issue in extant governance theory is the notion of discriminant alignment, which refers to the need to “align transactions, which differ in their attributes, with governance structures, which differ in their costs and competencies, in a discriminating way” (Williamson, 1991, p. 79). Following this logic, the expectation is that the interplay among contractual functions and its project performance implications will depend on the context in which the collaborative NPD project is embedded. Current theorizing on the governance of collaborative NPD (e.g., Gerwin, 2004; Lambe, Morgan, Sheng, and Kutwaroo, 2009) has thus far identified the innovation objective of the collaborative NPD project (i.e., incremental versus radical objective) and the relational embeddedness of the involved partners (i.e., presence versus absence of prior collaboration) as two core contextual characteristics. Consequently, this study sets out to explore the interplay of different contractual governance functions across different contexts in relation to innovation objectives and relational embeddedness.

To achieve this goal, a configurational perspective is applied (e.g., Greckhamer, 2016; Ragin, 2008), which visualizes the conceptual framing of contracts as bundles of different contractual governance functions. Applying a configurational lens has several important advantages in exploring how different combinations of contractual functions affect the performance of NPD projects. In particular, it facilitates the capture of three types of causal complexity: conjunction (i.e., different conditions do not act in isolation but rather work in combination), equifinality (i.e., the presence of multiple paths to success), and causal asymmetry (i.e., low-performing configurations are not simply a mirror image of high-performing configurations). In this article, the authors adopt this configurational perspective to inductively identify high-performing and low-performing contractual configurations across different contexts. Whereas high-

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performing configurations reflect bundles of different contractual functions that consistently lead to above-standard project performance (i.e., strong satisfaction with the progress of the collaborative NPD project, the collaborative NPD project fully succeeds in achieving intended outcomes), low-performing configurations reflect bundles that lead to below-standard project performance (i.e., strong dissatisfaction with the project's progress, partners clearly fail to achieve intended outcomes).

In this study, data were collected on the contract structure and the project performance of 125 collaborative NPD projects. In line with the conceptualization of contracts as bundles of different contractual functions, the authors apply “fuzzy set qualitative comparative analyses” (fsQCA) (Ragin, 2008) to explore the core research question. Conducting a factor analysis, this study first identifies three important types of contractual function: (1) coordination function, (2) intellectual property safeguarding function, and (3) safeguarding from severe breaches function. Second, it conducts an inductive, set-theoretic comparative method to identify high-performing and low-performing contractual configurations in different contextual settings.

The findings in this study contribute to extant research on the governance of collaborative NPD, illuminating how particular bundles of contractual functions can help address the different governance challenges at stake. At the same time, it makes a contribution to existing management research on contracts. In their recent literature review on the role of contracts, Schepker et al. (2014, p. 197) observed that “few scholars, however, examine the performance implications of contract structure.” This study demonstrates the relevance of applying a configurational perspective on the project performance implications of contracts. Finally, the findings here provide managers with specific guidance on how to design contracts for collaborative NPD in different settings.

Governance of Collaborative NPD: State of the Art

Core Challenges in Governing Collaborative NPD

Engaging in collaborative NPD projects, where independent organizations pool their resources to jointly develop new products or services, has been widely acknowledged as a valuable strategy to complement internal innovation activities (e.g., Doz, 1996; Faems et al., 2005; Sampson, 2007). Collaborative NPD

projects help to reduce the costs and risks of NPD activities. Moreover, they create alternative opportunities for synergistic recombination of knowledge and resources, which might not be available within the firm.

At the same time, engaging in joint NPD projects creates important governance challenges. One core challenge in collaborative NPD is the mitigation of opportunistic behavior (Gulati, 1995; Li, Eden, Hitt, and Ireland, 2008). When individuals from different partners collaborate intensively in NPD activities, unintended knowledge spillovers can occur, triggering competitive learning races in collaborative NPD projects with devastating consequences for one or both partners (Alvarez and Barney, 2001). Minimizing the risk of such opportunistic battlefields is therefore an important governance issue.

A second governance challenge is the avoidance of coordination gaps, which are defined as “instances in which required coordination is greater than actual coordination” (Gerwin, 2004, p. 241). As NPD activities often generate unexpected problems, intensive exchange of information is an important prerequisite (Faems et al., 2008). At the same time, achieving coordinated action across organizational boundaries is difficult since partners often have differing decision structures and organizational cultures (Gulati and Singh, 1998). In this way, coordination gaps are likely to emerge in collaborative NPD projects, which can hamper successful realization of the objectives (Gerwin, 2004).

Contracts as Structural Governance Mechanism

The initial structural design of collaborative NPD projects has been identified as an important area in seeking to address core governance challenges. Whereas governance scholars (Gulati, 1995; Gulati and Singh, 1998) focused initially on the choice between equity and nonequity structures in governing interfirm relationships, attention has shifted to the contract as an important structural governance mechanism (Schepker et al., 2014). When forming a partnership, collaborating firms can draft a formal agreement with one another. Such a contract helps to codify the terms of an agreement, keeping in mind the future contingencies that are envisaged (Abdi and Aulakh, 2017; Colombo, 2003).

Research on the role of contracts in governing interfirm relationships has traditionally focused on the safeguarding function of contracts, emphasizing that, through specifying particular provisions in the

contract, the risk of opportunistic action can be reduced (Dwyer and Oh, 1988; Hennart, 1991; Klein et al., 1978; Parkhe, 1993; Pisano, 1989). More recently, studies have emphasized that, in addition to safeguarding, contracts can also incorporate other functions such as promoting coordination of interfirm relationships (Ariño and Ring, 2010; Lumineau, 2017; Reuer and Ariño, 2007; Ryall and Sampson, 2009; Schilling, 2009). In particular, they argue that contracts can contain not only provisions to mitigate opportunistic action but also clauses that specify how partners must share information in order to facilitate coordinated action. In line with these arguments, different studies have empirically connected different contractual provisions to different contractual governance functions. Analyzing the presence or absence of particular provisions in strategic alliance contracts, several scholars (e.g., Malhotra and Lumineau, 2011; Reuer and Ariño, 2007), make a distinction between provisions with an enforcement function and provisions with a coordination function. Focusing on the particular setting of collaborative NPD projects, Ryall and Sampson (2009), identify three types of provisions: (1) provisions that specify firm obligations, (2) provisions that stipulate monitoring activities, and (3) provisions that codify penalties for noncompliant behavior.

First indications suggest that these different contractual functions not only coexist but also interact with each other. Lumineau and Malhotra (2011), for instance, found a positive interaction effect between what they term “contractual governance structure” and “coordination focus” on interest-based negotiations between partnering firms. They explain this finding in terms of a process where spending time on drafting contract details “allows the parties to better understand each other’s interests and to establish working rules and habits for how to amicably resolve points of contention” (Lumineau and Malhotra, 2011, p. 548). Using a similar empirical approach, Schilke and Lumineau (2016) report a significant and negative interaction effect between contractual control and coordination provisions on the level of conflict between the partners.

However, studies that examine the interplay between different contractual functions and their project performance implications in the particular context of collaborative NPD are lacking. This gap in the research literature is important because different studies on the governance of collaborative NPD seem to offer opposing suggestions. The case study of Faems et al. (2008) suggests that particular combinations of control and

coordination functions can create specific contractual interface structures that foster joint problem solving and positive trust dynamics, which in turn contribute to the successful development of new products. Other studies, however, suggest that combining safeguarding and coordination functions could well lead to excessive formalization, which might actually enhance the risk of opportunistic action (Walter et al., 2015) or make coordinated action more difficult (Smets et al., 2016). This study, therefore, aims to conduct an in-depth exploration of the interplay among different contractual functions and their project performance implications.

Discriminating Alignment and the Role of Contracts in Collaborative NPD

A core assumption of collaborative governance theory centers on the importance of discriminating alignment, implying that the nature of the governance structure should match the core characteristics of the collaborative transaction (Williamson, 1991). The stronger the alignment between the governance structure and the transactional characteristics (i.e., level of uncertainty, level of asset specificity), the greater the likelihood of success (Gong, Shenkar, Luo, and Nyaw, 2007; Poppo and Zenger, 2002). Based on this theoretical insight, the expectation is that different collaborative NPD contexts will require different (combinations of) contractual governance functions. Conducting an in-depth analysis of collaborative NPD projects, Ryall and Sampson (2009) have identified the innovation objective (i.e., incremental versus radical objective) of the project and the presence/absence of prior collaboration as two important sources of heterogeneity in contract structures. Moreover, as discussed below, extant research on the governance of collaborative NPD strongly indicates that these two contextual conditions may indeed influence the effectiveness of particular contractual governance functions.

Innovation objective. Firms can engage in collaborative NPD projects for different objectives (Belderbos et al., 2004; Faems et al., 2005; Schleimer and Faems, 2016; Schleimer and Shulman, 2011). On the one hand, they can collaborate with external partners in jointly exploiting existing products and technologies in order to generate incremental innovation. On the other hand, they can also use interfirm collaboration for more explorative objectives, leading to more radical innovation. Incremental NPD projects set out to

improve existing products by engaging in exploitative activities (March, 1991). The aim of radical NPD projects, however, is to devise entirely new products through explorative activities (Tushman and Smith, 2002).

In the broader NPD literature, it is widely accepted that, since incremental and radical NPD projects ask for different types of activity (i.e., exploitative versus explorative), different organizational designs are required (Jansen, Van Den Bosch, and Volberda, 2006). Moreover, initial research indications suggest that incremental and radical NPD projects require different contractual designs. Conducting survey research on 151 NPD alliances, Lambe et al. (2009) found that the relationship between formalization—i.e., the use of explicit rules to govern business activities—and performance is different for exploration and exploitation contexts. On the basis of their case study, Faems et al. (2008) concluded that, for explorative R&D alliances, partners require a broad contractual interface structure. At the same time, these scholars acknowledged that, for more exploitative R&D alliances, which have a greater focus on incremental innovation, a narrower contractual interface might make sense. This study, therefore, considers the innovation objective as an important contextual factor when exploring the project performance implications of the interplay among different contractual governance functions in collaborative NPD projects.

Relational embeddedness. Firms can engage in collaborative NPD projects with familiar partners—i.e., partners with whom a history of prior collaboration is present—or unfamiliar partners. Existing research on the governance of collaborative NPD clearly indicates that the presence/absence of prior collaboration substantially influences the choice and effectiveness of particular contractual governance functions. When partners share a history of prior NPD collaboration, the interactions among managers and engineers of both partners promote the establishment of in-depth socialization processes (Gerwin, 2004). In such circumstances, partners can rely on mutual trust as an informal safeguarding mechanism, reducing the need for a formal safeguarding mechanism (Gulati, 1995). Yet, mutual learning experiences during prior collaboration can strengthen partners' ability to use the contract as a valuable coordination device (Mayer and Argyres, 2004). In other words, extant research suggests that, in the presence of prior collaboration, the need for a contractual safeguarding function decreases, whereas the

effectiveness of the contractual coordination function increases.

In sum, the innovation objective of collaborative NPD projects and the history of prior collaboration have been identified as two important contextual conditions when considering governance challenges and structural solutions. Therefore, this study gives explicit consideration to these two contextual conditions when exploring the performance implications of the interplay among different contractual governance functions.

Toward a Configurational Perspective on Contracts

This article adopts a configurational perspective in addressing the core research objectives. Configurational scholars apply a holistic mode of inquiry, emphasizing that “parts of a social entity take their meaning from the whole and cannot be understood in isolation” (Meyer, Tsui, and Hinings, 1993, p. 1178). Given this holistic stance, they assume nonlinearity, implying that “variables found to be causally related in one configuration may be unrelated or even inversely related in another” (Meyer et al., 1993, p. 1178). In line with the configurational perspective, this study conceptualizes contracts as bundles of contractual functions that can be combined in different ways.

Applying a configurational perspective facilitates the capture of three types of causal complexity: conjunction, equifinality, and asymmetry (Greckhamer, 2016; Ragin, 2008). Conjunction means that contractual functions may not impact the performance of collaborative projects in isolation from one another. Instead, it represents specific combinations of conditions (e.g., types of contractual function) that consistently produce high and low levels of performance (Greckhamer, 2016; Ragin, 2008). Both the presence and the absence of conditions in these combinations can influence related outcomes. Equifinality means that different combinations of initial conditions may be associated with similar outcomes (Doty, Glick, and Huber, 1993). This implies that companies can choose from different contractual designs that have equal merits. Finally, a configurational perspective embraces the notion of causal asymmetry. This means that conditions leading to the presence of an outcome may differ from the conditions leading to the absence of the outcome (Ragin, 2008).

This article adopts the configurational perspective in order to obtain a richer understanding of the interplay

between different contractual functions and its implications for performance. In particular, the core objective is to inductively identify different types of high-performing and low-performing contractual configurations, reflecting bundles of different contractual functions.

Methodology

Research Setting

To explore high- and low-performing contract configurations for collaborative NPD projects in different innovation and relational settings, it was important to collect fine-grained data on contract design, project performance, innovation objectives, and relational embeddedness. The authors, therefore, devised and distributed a survey to measure the variables of interest among managers who were actively involved in a collaborative NPD project. For data collection, the authors relied on the practitioner population of the Product Development and Management Association (PDMA).

Survey Development and Pretesting

The survey instrument was developed over several phases. The authors relied on the literature to select measures for the study that were both appropriate and in current use. The first version of the survey was pilot tested with a group of three scholars and ten Dutch NPD managers who were members of the Dutch PDMA network. This pretest showed that the selected measures had a high face validity and consistency, requiring only minor modifications to improve the readability of the final version of the survey.

Data Collection Procedures

In the questionnaire, the authors defined collaborative NPD projects as projects in which two independent firms are involved for the purpose of the joint development of new or improved products or services (Hoang and Rothaermel, 2010). Between November 2011 and February 2012, permission was given to distribute the survey at two international practitioner conferences of the PDMA, the “Co-Development Conference” in San Diego and the “PDMA Conference on Social Product Development and Co-Creation” in Phoenix. Responses were received from 42 out of 80 participants in San Diego and 30 completed surveys out of the 300 participants in Phoenix. In addition, in April 2012, the

PDMA issued an invitation to all PDMA members to complete an online version of the survey via its e-newsletter and via an e-mail to its members. Out of a total sample of 3300 practitioners from the PDMA membership database 108 managers completed the surveys. From an analysis of the core variables, there were no significant differences between online and offline groups of respondents.

To ensure that suitable respondents were included in the final sample, only managers who had key roles in recently initiated interfirm NPD projects took part in the survey. Furthermore, in asking for the most recently initiated project, the authors sought to avoid self-selection bias (i.e., preferentially choosing to report on a project that had been successfully completed). At the same time, asking participants to report on an ongoing project reduced retrospective respondent bias. In total, 180 completed survey responses were received, representing 180 different collaborative NPD projects. This number of responses is similar to other studies (e.g., Griffin, 1997) that relied on the PDMA network to collect survey data on innovation-related topics. In the case of 125 projects, respondents indicated that a formal contract was signed at the initiation of the project. The authors, therefore, relied on these 125 collaborative NPD projects to provide the final sample for this study.

The final sample included respondents who were situated in 18 different countries. The majority of the respondents (75) were located in the United States, which is in line with the population of the PDMA network. While the responding companies had on average 9405 employees, they ranged from 4 to 150,000 employees. In addition, while 35% of the projects took place between international partners, the majority (65%) involved domestic partnerships. The respondents also indicated the type of partner they selected for their NPD project: 65 projects were with suppliers, 30 with customers, 5 with competitors, 16 with universities/other research institutions, and 9 with other types of partner. The average age of the NPD projects in this study was 12.57 months, and the average expected time to project completion was 11.85 months.

Outcome of Interest: Project Performance

Project performance. In the survey, respondents were asked to provide their perception on the current status of the project in terms of its performance. Relying on the scales of Hoegl, Weinkauf, and Gmuenden (2004), respondents indicated on a 7-point Likert scale (from strongly disagree to strongly agree) the extent to

Table 1. Matrix With Tetrachoric Correlations Among Contractual Provisions

	Mean	1	2	3	4	5	6	7
1 Obligation to exchange periodic written reports of all relevant transactions	.64							
2 Obligation to give prompt written notice of any departures from the agreement	.75	.52**						
3 Right to examine and audit all relevant records	.55	.49**	.41**					
4 Designation of certain information as proprietary and subject to the confidentiality provisions of the contract	.98	-.38	-.25	.20**				
5 Nonuse of proprietary information even after termination of agreement	.83	.12**	-.23	.05**	.57**			
6 Termination of the agreement	.92	.42**	.37**	.07**	.13**	.52**		
7 Arbitration clauses	.78	.49**	.45**	.28**	-.21	.32**	.52**	
8 Lawsuit provisions	.70	.38**	.27**	.40**	.67**	.45**	.62**	.90**

** $p < .05$.

Notes: Correlations before smoothing, $N = 125$ and includes all collaborative NPD projects that employed a contract.

which they agreed with the following statements: (1) going by the current status of the collaborative project, it can be regarded as successful; (2) all collaborative project goals have so far been achieved; (3) so far, the output of the collaborative project is of high quality; (4) the people of our firm who participate in this collaborative project are satisfied with its performance so far; (5) our management is so far fully satisfied with this collaborative project. In this article, the average score on these five items is used to measure project performance of the interfirm NPD projects. This combined scale shows high reliability with a Cronbach's alpha of .90. The average performance in the sample of 125 projects is 5.31 with a standard deviation of .98.

Conditions Used for Creating Membership Sets

Contractual functions. In his seminal article, Parkhe (1993) identified a set of eight different contractual provisions that are often used in contracts for interfirm relationships. This set has been used frequently in subsequent research to both measure the degree of specification in contracts (Parkhe, 1993) and to distinguish between different contractual functions (Reuer and Ariño, 2007). In the questionnaire, the same eight contractual provisions were listed, and the respondents were asked to indicate whether these provisions were present or absent in the contract.

Following Reuer and Ariño (2007), the authors subsequently performed an exploratory factor analysis to verify the dimensionality of the eight provisions. Binary variables violate the assumption of multivariate normality required for factor analyses. Therefore, the tetrachoric correlations among the eight provisions were calculated, which formed the input of the factor

analysis. To compute these correlations, the SPSS syntax "Tetra Com" was used, written by Lorenzo-Seva and Ferrando (2012). Table 1 provides an overview of the eight provisions and shows the estimated tetrachoric correlations among the contractual provisions.¹

Table 2 presents the results of a principal components factor analysis after Varimax rotation. Three factors with an Eigenvalue of more than 1 were retained, which together explained 61.01% of the variance in the data. As shown in Table 2, the first factor loaded on the same variables as the first factor in the study by Reuer and Ariño (2007). However, the five provisions that loaded on the second factor and represented the safeguarding function in their study separated into two constituent factors in this study. In a more recent study, Ryall and Sampson (2009) also identified three factors that accounted for the majority of the variance across 52 contracts used in technology development projects. Taking into account these prior studies, the authors of this study label the three factors as (1) coordination function, (2) intellectual property safeguarding function, and (3) contractual breach safeguarding function. These three factors were subsequently used to create three fuzzy set measures.

Prior collaboration. In the survey, respondents were asked whether they had collaborated with the same partner previously. Based on this information, a binary variable was constructed, having the value of 0 when no prior collaboration was present and the value of 1 when prior collaboration was present. In total, a history of prior collaboration was present in 45 out of the 125 interfirm NPD projects.

¹Five cases had one missing value for one of the eight contractual provisions and were replaced with a 0 indicating the absence of that particular provision. The factor structure and fsQCA results remained stable also after removing these five cases from the analyses.

Table 2. Varimax-Rotated Factor Pattern of Contractual Provisions

Contractual Provision		Contractual Breach Safeguarding Function (Factor 1)	Intellectual Property Safeguarding Function (Factor 2)	Coordination Function (Factor 3)
1	Obligation to exchange periodic written reports of all relevant transactions	.198	–.138	.720
2	Obligation to give prompt written notice of any departures from the agreement	.075	–.041	.656
3	Right to examine and audit all relevant records	–.061	.137	.643
4	Designation of certain information as proprietary and subject to the confidentiality provisions of the contract	.178	.789	–.012
5	Nonuse of proprietary information even after termination of agreement	.054	.788	.075
6	Termination of the agreement	.507	.188	.131
7	Arbitration clauses	.929	–.157	.082
8	Lawsuit provisions	.919	.294	–.024
	Eigenvalue	2.27	1.47	1.14
	Percent of variance	28.35	18.42	14.25
	Cumulative percent of variance	28.35	46.77	61.01

Note: $N = 125$.

Bold print indicates the largest factor loading for each contractual provision.

Incremental and radical innovations. To differentiate incremental from radical collaborative NPD projects, the authors relied on the scale from Gatignon, Tushman, Smith, and Anderson (2002) and asked respondents to indicate on a 7-point Likert scale (from strongly disagree to strongly agree) if the aim of the innovation project: (1) was a minor improvement over the previous technology (reversed item), (2) was a breakthrough innovation, (3) led to products that were difficult to replace with substitutes using older technologies, and (4) represented a major technological advance. These items were combined to form a scale that showed high reliability with a Cronbach's alpha of .83. The midpoint of this 7-point scale was used to differentiate between incremental and radical innovation. Innovation projects with an average value below 4 were labeled as "incremental." Innovation projects that had an average value of 4 or above were labeled as "radical." In this way, 29 projects were labeled as incremental, whereas 96 projects were labeled as radical.

To mitigate risks related to common method variance, the authors designed the survey procedure following recommendations by Podsakoff, MacKenzie, Lee, and Podsakoff (2003). First, common method variance between the core variables was ruled out by asking principally for factual information on the collaborative NPD project (e.g., the contract design, presence/absence of prior collaboration, the objective of the innovation project). The only exception was the performance measure, where the survey clearly asked for respondent opinions. Second, although information was collected from the same source, common method variance was controlled for by

separating the outcome measure and the other core variables in the survey. Third, the survey introduction made clear that respondent answers would remain anonymous: this was to reduce the likelihood of respondents refining their responses in more "socially acceptable" ways.

Data Analysis Method

This study conceptualizes contracts as bundles of systematically interdependent contractual functions (i.e., coordination, intellectual property safeguarding, contractual breach safeguarding). The authors utilized fsQCA as the means to conduct configurational analyses (Ragin, 2008). This approach is suitable when using a configurational lens since it conceptualizes cases as "configurations of qualitatively distinct causal conditions" (Soda and Furnari, 2012, p. 287). The basic intuition behind fsQCA is "that comparison of cases can allow a researcher to strip away attributes that are unrelated to the outcome in question" (Fiss, 2011, p.402). This technique, therefore, allows researchers to study whether different combinations of conditions are more consistently associated with certain outcomes of interest through the examination of subset relations (Fiss, 2011; Meuer, 2013; Ragin, 2008).

Calibration of Measures

FsQCA begins with the transformation of variables into calibrated sets. Calibration is the process in which set membership scores are assigned to cases (Schneider and Wagemann, 2012). The direct method

of calibration described by Ragin (2008) was used. This method of calibration requires the selection of a crossover point in the original interval scale from which deviation scores are calculated. Furthermore, a value of full membership and a value of full nonmembership need to be selected to function as upper and lower bounds (Fiss, 2011; Ragin, 2008). For each variable, a threshold value was specified, determining full membership (1), full nonmembership (0), and a crossover point of maximum ambiguity regarding membership in a set of interest (.5). Using these values, the original interval scales were transformed into fuzzy membership scores that range from 0 to 1. Below is a description of how the threshold values for calibrating fuzzy sets were calculated.

The authors created one fuzzy set measure for “high performance” and one for “low performance.” The performance indicator of the collaborative NPD projects in the sample was normally distributed over the full range of the scale running from 1 (low performance) to 7 (high performance). With regard to membership of the set of high-performing collaborative NPD projects, the authors coded the firm “1” if it had a “high” performance (a score ≥ 6.0 , i.e., the 75th percentile or higher), and “0” if it had a “low” performance (a score ≤ 4.4 , i.e., the 25th percentile or lower). The crossover point was set at 5.14, which reflects that average project performance in the full sample.² Negation of high performance was used to examine which configurations lead to low performance. This means that cases with low performance (a score ≤ 4.4 , i.e., the 25th percentile or lower) are coded “1” and cases with high performance (a score ≥ 6.0 , i.e., the 75th percentile or higher) are coded “0.” The crossover point was again set at 5.14.

The contractual factors representing safeguarding from severe breaches, intellectual property safeguarding, and coordination function, included 3, 2, and 3 provisions, respectively. To calibrate the factors *contractual breach safeguarding function* and *coordination function*,

thresholds of 3 for full membership were used, 0 for full nonmembership, and the midpoint of 1.5 as the crossover point. The upper and lower thresholds were 3 and 0, which represent the maximum and minimum number of provisions for these two types of contractual function.³ For the factor *safeguarding intellectual property*, the authors used the values of “2” for full membership, “0” for full nonmembership, and “1” as the crossover point. In the results section, multiple sensitivity tests are provided showing that the results are robust when recalibrating the three conditions using different crossover points.

FsQCA cannot analyze cases with scores of exactly .5 since this represents the point of indifference. This was obviated by removing such cases from the analyses; prior applications were followed by adding a constant of .001 to all conditions that had a membership score below 1 (Fiss, 2011; Greckhamer, 2016; Ragin, 2008).

Analytical Procedures and Membership Sets

The first step in the fsQCA using the calibrated data involved the construction of a truth table with sets that specify the possible outcomes (i.e., high or low project performance) and conditions (i.e., the three types of contractual function). Case membership of each set was determined by using the direct calibration method (Ragin, 2008, pp. 86–94). As social phenomena tend to be limited in their empirical diversity, the fsQCA software deletes the unobserved configurations from the truth table. The algorithm requires the setting of a minimum threshold for consistency and a minimum number of cases per configuration (Misangyi and Acharya, 2014). Given the inductive nature of this study, the authors were interested in all possible solutions and therefore decided to set the frequency cut-off of the analysis to 1. Tables 4 and 5 show that three out of eight solutions covered only one case.⁴

Subsequently, the set of configurations were reduced by using a consistency threshold (Fiss, 2011; Greckhamer, 2016; Ragin, 2008). Set-theoretic consistency measures “the degree to which instances of an outcome agree in displaying the causal condition”

²Hoegl et al. (2004) found an average performance of 3.8 with a standard deviation of .39 and, in the study of Visser, Faems, Visscher, and Weerd-Nederhof (2014), the performance average was 3.52 with a standard deviation of .75. These two studies relied on a 5-point scale instead of a 7-point scale as in this study. The normalized average performance of these two studies is 5.14, which is exactly the average performance in the full sample of 180 projects in this study and is very close to the average performance in the final sample of 125 projects.

³It is not possible to include 1.5 clauses in a contract. By using this number, the relevant variation in the reliance on particular types of clause is captured in the fuzzy scores. For instance, by using 1.5 as a crossover point, a contract with 2 clauses is equally more in than out of the target set (the fuzzy membership score is .73) than a contract with 1 clause is more out than in the target set (the fuzzy membership score is .27).

⁴For fsQCA studies of a relatively small-N nature—i.e., with 10–50 cases—it is commonly accepted to analyze all configurations that have at least one case (Greckhamer, Misangyi, and Fiss, 2013). The four subgroups included 14, 11, 65, and 36 cases, so there is a relatively small-N in three of the four subgroups. If a more conservative cut-off score of 2 is used as did, for example, Bell, Filatochev and Aguilera (2014) in their study, the single-case solutions disappear from Tables 4 and 5, leading to negligible changes in the coverage and consistency scores of these solutions.

Table 3. Descriptive Statistics and Correlations of the Raw and the Calibrated Values

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10
1 Project performance	5.32	.98										
2 Innovation radicality	5.01	1.40	-.04									
3 Prior collaboration ^a	.36	.48	.28**	-.12								
4 Coordination function (sum)	1.94	1.04	.10	.02	.12							
5 Intellectual property safeguarding function (sum)	1.81	.43	-.15	-.10	.02	-.02						
6 Contractual breach safeguarding function (sum)	2.40	.93	.03	.01	.02	.36**	.27**					
7 Project performance (calibrated)	.60	.39	.91**	-.04	.26**	.12	-.15	.08				
8 Coordination function (calibrated)	.64	.33	.11	.01	.12	.99**	-.03	.35**	.14			
9 Intellectual property safeguarding function (calibrated)	.86	.20	-.15	-.10	.02	-.02	1.00**	.27**	-.15	-.03		
10 Contractual breach safeguarding function (calibrated)	.77	.30	.02	.02	.01	.35**	.24**	.99**	.07	.35**	.24**	

* $p < .05$. ** $p < .01$.^aDummy coding: 0 = no prior collaboration 1 = prior collaboration.

Notes: N = 125. Significance levels are two-tailed.

(Ragin, 2008, p. 44). From the literature, it follows that no universally accepted consistency threshold value exists (Schneider and Wagemann, 2012, pp. 127–28). As suggested by Crilly (2011), none of the recommendations found in the literature should be applied mechanistically. Therefore, the authors relied on the guidelines specified by Schneider and Wagemann (2012, pp. 127–28) to determine an appropriate cut-off value. They suggest that research should justify its consistency threshold by making reference to research-specific features, such as the strength of theoretical expectations. The more pronounced the upfront theoretical expectations, the higher the consistency measure that should be used. As Maggetti and Levi-Faur (2013, p. 199) argue: “exploratory analysis requires lower consistency than rigorous hypothesis testing.” Because the authors conducted an inductive study without upfront hypotheses, they set the consistency threshold at the generally accepted minimum recommended value of .75 (Garcia-Castro and Francoeur, 2016; Ragin, 2006, 2008; Schneider and Wagemann, 2012).⁵

As a third step, fsQCA reduced the remaining configurations by eliminating all irrelevant conditions. The algorithm for counterfactual analysis included in the fsQCA 2.5 software was used (Ragin, Drass, and Davey, 2006), allowing for the identification of core and peripheral conditions (Fiss, 2011). Given the explorative nature of this study, the authors did not prespecify how the three conditions are related to the

outcomes of interest. This implies that, in order to derive the intermediate solutions, each condition is allowed to be “present or absent.” This conservative approach is similar to the one used by Fiss (2011) and is appropriate for explorative studies, where the extant literature is inconclusive on whether the presence or absence of certain conditions lead to the outcome under study (Misangyi and Acharya, 2014). In this study, there was no strong upfront theory to suggest, for example, that only the presence of the coordination function would be associated with high project performance. As no strong upfront expectations were formulated, the intermediate solutions and the complex solutions offered by the software are identical. A benefit of not using external assumptions is that the configurations stay as close as possible to the data set used (García-Castro, Aguilera, and Ariño, 2013). This approach therefore defines the “coreness” of the conditions only in terms of the strength of the evidence relative to the outcome (Fiss, 2011).

The final output of the analyses includes combinations of conditions that consistently lead to high project performance and low project performance. For each combination, the output not only specifies whether the presence of a condition is crucial to achieve a specified outcome but also whether the absence of a condition is required.

Results: fsQCA Subgroup Analyses

The means, standard deviations, and correlations among the variables are shown in Table 3. For each of the following subgroups, the authors ran separate fsQCAs: (1) incremental NPD projects with new partners ($n = 14$), (2) incremental NPD projects with

⁵To determine a consistency threshold value, the authors carried out an evaluation for each subgroup to check whether a gap could be observed in the distribution of the consistency values, since this can govern the decision concerning where to place the consistency threshold (Crilly, 2011; Schneider and Wagemann, 2012). For both the high- and low-performance analyses, a clear gap could be observed, justifying the choice of .75 as a cutoff value. As can be seen in Tables 4 and 5, the actual consistency values of the solutions included in the subgroups were usually much higher than the minimum value of .75.

Table 4. High Performance Configurations for Different Subgroups

Type of function	Subgroup Solution	Incremental No Prior Collaboration 1a	Incremental No Prior Collaboration 1b	Incremental Prior Collaboration 2	Radical No Prior Collaboration 3a	Radical No Prior Collaboration 3b	Radical Prior Collaboration 4a	Radical Prior Collaboration 4b
Coordination function		●	⊗	●	●	⊗	●	●
Intellectual property function		●	●	●	●	⊗	●	●
Breach of contract function		●	⊗	●	⊗	⊗	●	●
Consistency		.81	.80	.86	.79	.83	.80	.78
Raw Coverage		.70	.14	.80	.21	.17	.75	.68
Unique Coverage		.62	.05	.80	.11	.07	.10	.03
Overall Solution Consistency		.82		.80	.81		.80	
Overall Solution Coverage		.76		.86	.28		.78	
Frequency (# of cases per solution)		9	1	8	5	1	20	20

For the configurational analyses with fsQCA 2.5 the sample of 125 collaborative NPD projects was used. Legend: large black circles (●) are core present conditions, small black circles (●) are peripheral present conditions, large circles with a cross (⊗) are core absent conditions, small circles with a cross (⊗) are peripheral absent conditions; blank spaces indicate a “don’t care” condition.

existing partners ($n = 11$), (3) radical NPD projects with new partners ($n = 65$), and (4) radical NPD projects with familiar partners ($n = 36$).⁶

Conditions for High and Low Project Performance of Collaborative NPD Projects

Tables 4 and 5 show the results of the fuzzy set subgroup analyses of collaborative NPD projects that are associated with high and low project performance. Each column represents a configuration of conditions, in this case, three types of contractual function. The notation system from Ragin and Fiss (2008) is used, where black circles denote the presence of a condition, and empty circles with a cross indicate its absence. Large circles represent core conditions and small circles indicate peripheral conditions. Core conditions only appear in the intermediate and parsimonious solutions, while peripheral conditions (sometimes referred to as complementary conditions) occur only in the intermediate solutions.

High Performance Configurations: Ideal Types

Using fsQCA analysis, the authors identified, for each subgroup, specific bundles of contractual functions leading to high project performance. Table 4 illustrates all high performance configurations in the four different subgroups. All solutions have a consistency of .78 and above. The solution coverage in the four subgroups ranges from .14 to .80, which indicates that 14% to 80% of the high performance cases are members of the identified and presented solutions. The solutions are sorted within each of the four subgroups, based on their unique coverage (Fiss, 2011; Greckhamer, 2016). For each solution, the number of cases is reported (Aversa, Furnari, and Haefliger, 2015).

Subgroup 1: Incremental NPD projects with unfamiliar partners. For incremental NPD projects between partners without a history of prior collaboration, the sufficiency analysis reveals two contractual configurations (solutions 1a and 1b) that lead to membership of the set of high-performing projects within this particular

⁶Another option was to conduct one analysis and include the innovation objective and relational embeddedness as additional conditions. However, in line with prior governance literature, contract design was conceptualized as a step that follows project and partner selection. In other words, the assumption is that firms first select the type of project and the type of partner for the collaboration and then subsequently negotiate with the other partner a contract that fits as well as possible with the project and partner characteristics. Following this logic, it made more sense to conduct separate analyses for each subgroup.

Table 5. Low Performance Configurations for Different Subgroups

Subgroup Solution	Incremental No Prior Collaboration 5	Incremental Prior Collaboration	Radical No Prior collaboration	Radical Prior Collaboration
Type of function				
Coordination function	●			
Intellectual property function	●			
Breach of contract function	⊗			
Consistency	.88	No solution	No solution	No solution
Raw Coverage	.24			
Unique Coverage	.24			
Overall Solution Consistency	.88			
Overall Solution Coverage	.24			
Frequency (# of cases per solution)	1			

For the configurational analyses with fsQCA 2.5 the sample of 125 collaborative NPD projects was used. Legend: large black circles (●) are core present conditions, small black circles (●) are peripheral present conditions, large circles with a cross (⊗) are core absent conditions, small circles with a cross (⊗) are peripheral absent conditions; blank spaces indicate a “don’t care” condition.

subgroup. Solution 1a combines coordination and safeguarding from severe breaches as core contractual functions, with intellectual property safeguarding as a peripheral contractual function. Solution 1b shows an alternative path to high performance that combines three conditions: reliance on intellectual property safeguarding combined with limited or no reliance on coordination, and contract breach safeguarding.

The coverage scores provided in Table 4 indicate the percentage of cases that rely on the identified contract designs for achieving high performance. Comparing the unique coverage of solutions 1a and 1b shows that solution 1a’s unique coverage is substantively greater than that of solution 1b, which also indicates the relatively high prominence of this particular configuration in the subgroup in question. Still, the two solutions suggest that, for incremental NPD projects where partners do not have a history of shared collaboration, two inherently different types of contract configuration can be used to achieve high project performance.

Subgroup 2: Incremental NPD projects with familiar partners. For incremental innovations developed by partners who share a history of collaboration, the sufficiency analysis resulted in one contractual design leading to high performance, depicted in solution 2. This configuration combines the contractual coordination function as a core condition and intellectual property safeguarding as a peripheral contractual function.

Subgroup 3: Radical NPD projects with unfamiliar partners. For radical NPD projects with new partners, two rather different, high-performing contract configurations

emerge: Solution 3a combines strong reliance on contractual coordination and limited reliance on safeguarding from severe breaches as core conditions. At the same time, the intellectual property safeguarding function is a peripheral condition in this particular contractual bundle. Solution 3b represents a completely different contractual configuration, reflecting limited reliance on all three functions. It is worth noting that solution 3a’s unique coverage is substantively greater than that of solution 3b.

Subgroup 4: Radical NPD projects with familiar partners. In the subgroup of radical NPD projects with familiar partners, two high-performing contract designs emerge. The contractual coordination function is at the core of both of these high-performing configurations. The results suggest that, in this type of project, strong reliance on the coordination function should be complemented with strong reliance on the contract breach safeguarding function (i.e., solution 4a) or with strong reliance on the intellectual property safeguarding function (i.e., solution 4b). This suggests that, for radical NPD projects with familiar partners, the two types of safeguarding function act as substitutes and allow for “neutral permutations” around the core condition of contractual coordination.

Low Performance Configurations

As Table 5 shows, the analyses identified one configuration that leads to a low performance outcome in incremental projects where partners lack a history of prior collaboration. Solution 5 shows that a configuration reflecting (1) strong reliance on the coordination

and intellectual property safeguarding functions and (2) limited reliance on the contract breach safeguarding function results in low performance for incremental NPD projects between unfamiliar partners. In line with the notion of causal asymmetry, it can be observed that this particular configuration is not the mirror image of one of the high-performing configurations for incremental NPD projects with unfamiliar partners. At the same time, it should be noted that this bundle proved to be a rare case. For the other subgroups, no contract configurations could be identified that consistently led to low project performance.

Sensitivity Tests

To evaluate the robustness of the results, several sensitivity analyses were conducted. Following Fiss (2011), a first test was applied as to whether the findings are robust to the use of alternative crossover points for the three conditions. Consequently, the authors added 25% to the crossover points of the three conditions. Minor changes are observed regarding the kind of neutral permutations that occur as well as the specific number of solutions and subsolutions, but the interpretation of the results remains largely unchanged.

Second, as recommended by Schneider and Wagemann (2012, p. 128), the analyses were replicated with a more conservative consistency threshold of .8. In the first subgroup, solution 1b was removed from the analyses by this new threshold. The findings for subgroup 2 remain unchanged. In the third subgroup, solution 3a with an consistency of .79 was removed arising from this new threshold value. Solutions 4a and 4b are subject to slight change, where the main difference is that the two “don’t care” conditions become core absent conditions. This implies, for instance, that solution 4a now represents a configuration of strong reliance on the coordination and contract breach safeguarding functions and limited reliance on the intellectual property safeguarding function. By increasing the raw consistency threshold, fewer truth table rows are used for logical minimization. As a result, the new solutions are more consistent, but have much lower coverage. These solutions represent a subset of the solutions generated using the .75 consistency threshold, providing additional support for the robustness of the core results. For the discussion, the authors also took into account the alternative solutions that emerged from applying a more conservative consistency threshold,

ensuring that the core propositions hold for this set of solutions.

Discussion

In this study, the authors set out to increase their understanding of the project performance implications of contract configurations in collaborative NPD. A configurational lens was used to conceptualize contracts as bundles of contractual functions that influence the project performance of collaborative NPD. In addition, the expectation was that both the importance and interplay between specific contractual functions would be different across different contexts in terms of innovation objectives and relational embeddedness. The inductive, set-theoretic comparative method facilitated the generation of new findings that reach beyond the discrete-form analyses of most prior research on the role of contracts in collaborative NPD. These theoretical implications are first discussed below. Subsequently, the managerial implications of the findings are summarized. Finally, the authors point to the main limitations of their study and discuss avenues for future research.

Implications of Main Findings

In line with existing research, the factor analysis on the contract provisions points to the importance of making a conceptual distinction between the safeguarding and coordination functions of contracts. Moreover, the results appear to confirm the findings of Ryall and Sampson (2009) that, in the particular setting of collaborative NPD projects, it is relevant to make a further distinction between (1) intellectual property safeguarding, and (2) contract breach safeguarding. At the same time, the fsQCA analysis has allowed the authors to identify particular bundles of contractual functions that are high performing and low performing. In the results section, a description is provided of the high-performing and low-performing contractual configurations that were identified within different contextual settings. Comparing these bundles across these different settings, new insights emerge that enrich our current understanding of the interplay between coordination and safeguarding functions of contracts, and the impact of prior collaboration on the effectiveness of contracts.

The importance of combining coordination and safeguarding functions of contracts. Comparing the high-performing bundles across different settings, it

can be observed that, for each contextual setting, at least one high-performing contractual configuration is present where a strong reliance on the coordination function is a core condition. Prior research has already emphasized the benefits of contractual coordination, arguing that contractual coordination helps to achieve the desired collective outcomes by providing appropriate linkages between project partners (Malhotra and Lumineau, 2011). In addition, establishing contractual coordination fosters the exchange of information and communication that, in turn, enhances goal alignment between collaborating partners (Ryall and Sampson, 2009) and minimizes the uncertainty to which an exchange is exposed (Luo, 2002). Furthermore, contractual coordination promotes learning about the likely behaviors of the partners and minimizes misunderstandings about each other's intent (Lumineau, 2017). Explicitly exploring the performance implications of contractual bundles across different settings, the findings in this article indicate that a strong reliance on the contractual coordination function can be considered as best practice for collaborative NPD projects, leading to the following proposition:

Proposition 1: Strong reliance on the coordination function in contracts positively influences the project performance of collaborative NPD.

At the same time, the findings go beyond established insights by demonstrating that strong reliance on the coordination function is not a sufficient condition for high performance in collaborative NPD projects. For all of the contexts studied, none of the contracts where only the coordination function was strongly developed could be identified as a high-performing configuration. Instead, it is noted that, to realize high NPD project performance, strong reliance on the coordination function needs to be complemented with (1) strong reliance on the intellectual property safeguarding function and/or (2) strong reliance on the contract breach safeguarding function.

The particular type of safeguarding function that needs to be added to the coordination function depends on the contextual setting. The results show that the only context in which a combination of both safeguarding functions appears to add value is in incremental projects where a history of prior collaboration between partners is absent. In comparison with a situation where partners share a history of prior collaboration, behavioral uncertainty is relatively high in projects where a history of prior collaboration is absent (Das and Teng,

1998; Gulati, 1995). This suggests that, when prior collaboration is absent, the risk of opportunistic action is also increased. Moreover, as incremental projects involve improving products that already exist, the financial and reputational implications of opportunistic action by the partner firm might be relatively high. In sum, the setting of incremental collaborative NPD projects where partners lack a history of prior collaboration produces a situation where both the risks and the damaging implications of opportunistic behavior are considered to be high, requiring the safeguarding of different domains:

Proposition 2: For incremental NPD projects where a history of collaboration is absent, the coordination function in contract configurations needs to be complemented with both intellectual property safeguarding and contract breach safeguarding.

The results suggest that, in most other types of context, strong reliance on the coordination function should be complemented with either intellectual property safeguarding or contract breach safeguarding. For incremental innovation projects with a history of prior collaboration and for radical innovation projects with no history of prior collaboration, a combination of strong reliance on contractual coordination and strong reliance on intellectual property safeguarding represents a high-performing configuration. For radical projects with a history of prior collaboration, both safeguarding options represent feasible alternatives that can be bundled with strong contractual coordination in order to achieve high project performance. For these three latter contexts, however, complementing both safeguarding functions with the coordination function does not lead to a high-performing contractual configuration. The indication is that, in these settings, the risk of safeguarding overload is present. This leads to the following proposition:

Proposition 3: For incremental NPD projects with a history of collaboration and for radical collaborative NPD projects, the coordination function in contractual configurations needs to be complemented with either intellectual property safeguarding or contractual breach safeguarding.

History of prior collaboration and performance implications of contracts. In the interfirm governance literature, a discussion is ongoing about the effectiveness of

contracts when a history of prior collaboration is present. Some scholars argue that, when history of prior collaboration is present, the embedded relationship functions as an informal governance mechanism reducing the need for formal governance in terms of contracts (Gulati and Singh, 1998; Madhok and Tallman, 1998). Other scholars argue that, when a history of collaboration is present, contracts can embody the learning experiences of prior interactions, turning them into effective governance mechanisms for subsequent ones (Mayer and Argyres, 2004). This study's findings suggest that, to better understand the impact of prior collaboration on the effectiveness of contracts, it is important to explicitly consider the innovation objectives of the transaction. When comparing high-performing bundles 1a⁷ and 2, it should be noted that, in the setting of incremental projects, a history of prior collaboration reduces the need to complement strong reliance on the coordination function with strong reliance on contract breach safeguarding. When comparing high-performing bundles 3a and 4a/b, it is noted that, in radical projects, a history of prior collaboration actually helps to complement the coordination functions with the contract breach safeguarding function. In radical projects where a history of prior collaboration is lacking, strong reliance on the coordination function needs to be complemented with limited or no reliance on contract breach safeguarding. When a history of prior collaboration is present, however, it is no longer damaging (bundle 4b) and may even become helpful (bundle 4a) to complement the coordination function with the contract breach safeguarding function. Based on these observations, the following proposition is formulated:

Proposition 4: The impact of prior collaboration on the effectiveness of particular contractual configurations depends on the innovation context in which the collaborative NPD project is embedded.

Two high-performing contractual bundles were rare in the study sample (i.e., solutions 1b and 3b both received a low coverage score), but they are nonetheless worth noting. In the setting of incremental NPD projects without a history of collaboration, one high-performing solution emerged, encompassing strong reliance on the intellectual property safeguarding function and limited or no reliance on the other two

functions. In other words, this configuration represents a contractual design where, in terms of governance, the contract focuses predominantly on dealing with intellectual property issues. Such a contract design might be particularly relevant in a situation where two unfamiliar partners come together to exploit sensitive intellectual property in order to improve existing products. In this situation, intellectual property issues might be so complex and dominant that all contractual activities should focus on ensuring these rights are protected. In such a setting, the inclusion of additional functions may be too costly and time consuming to run in combination with the particular function of intellectual property safeguarding.

In the context of radical NPD projects between unfamiliar partners, this study reveals a high-performing contractual configuration that is characterized by limited reliance on all three contractual functions (solution 3b). Conducting case study research on R&D alliances, Klein Woolthuis, Hillebrand, and Nooteboom (2005) suggested that, instead of using contracts as safeguarding or coordination devices, they could also be used as a tangible expression of their mutual intention to be loyal partners. The new research results seem to suggest that, in the setting of radical NPD between unfamiliar partners where both relational uncertainty and technological uncertainty are high, relying on the contract as a “signal for showing commitment” (Klein Woolthuis et al., 2005, p. 835) instead of using it as a device to address safeguarding and coordination options might well be a valuable option.

Managerial Implications

This study offers several meaningful insights for decision-makers in collaborative NPD projects. Relying on the theoretical notion of equifinality and applying the fsQCA approach in the empirical analysis, the authors were able to demonstrate that, even within the same context, different configurations of relevant provisions can lead to high-performing outcomes (e.g., solutions 1a versus 1b, solutions 3a versus 3b, and solutions 4a and 4b). This finding suggests that managers of collaborative NPD projects do have potentially greater flexibility in designing high-performing contracts than commonly depicted in previous studies. That is to say, NPD partnerships can sometimes be accomplished successfully using rather different combinations of contractual functions. This is an important insight because it means that, if one combination of

⁷Here, the authors focus on bundle 1a as the coverage of this bundle is much greater than bundle 1b.

specific contractual functions may not suit the partnering firms, there may well be another combination of contractual functions that leads to a similarly fruitful partnership.

In line with recent research (Cao and Lumineau, 2015; Goo and Huang, 2009; Lumineau, 2017), the new findings in this article confirm the importance of contractual coordination for collaborative NPD. However, these findings also suggest that managers should complement coordination functions with safeguarding provisions to obtain high-performing bundles. At the same time, the exact combination of coordination and safeguarding provisions depends on the particular innovation objective of the NPD project and whether the partners already have a history of prior collaboration. In other words, managers should realize that collaborative NPD projects are embedded in particular settings, generating specific governance challenges that require diverse combinations of different contractual functions.

Limitations and Future Research

In this study, the authors explored contractual configurations in a particular setting (i.e., collaborative NPD projects between two partners), which limits the generalizability of the findings. Whereas several scholars, who started from the same set of contract provisions as the authors, identified two contractual functions, this study has aligned itself with the three-factor solution of contractual functions advanced by Ryall and Sampson (2009). Both this study and the Ryall and Sampson (2009) study considered the particular context of collaborative NPD projects. In this particular context, intellectual property was a particular issue of concern, which may explain why it emerged as a separate safeguarding function: this was not the case in other studies that looked at strategic alliances.

In this study, the authors focused solely on the innovation objective and the history of prior collaboration as two potentially relevant contextual factors. Their main purpose in including these two contextual variables was to demonstrate that high-performing and low-performing bundles can be substantially different in different settings. At the same time, the authors fully acknowledge that other important contextual factors (e.g., power asymmetry, collaborative experience, size of partners involved) exist that have the potential to influence the effectiveness of particular contractual configurations.

In addition to formal contracts, partnering firms can rely on alternative mechanisms to control and coordinate collaborative NPD projects. Numerous studies (e.g., Dyer and Singh, 1998; Madhok and Tallman, 1998) have pointed to the relevance and importance of informal governance mechanisms. At the same time, a discussion is still ongoing concerning the interplay between formal and informal governance mechanisms. Applying a configurational approach to identify high- and low-performing bundles of formal and informal governance mechanisms could prove to be a very interesting line of future research.

In this study, a validated survey instrument was used (Parkhe, 1993) to identify contractual configurations. Nevertheless, the authors acknowledge that securing access to actual contracts would facilitate the development of a more fine-grained and richer typology of contractual configurations. Although gaining access to actual contracts is far from easy, some studies (Faems et al., 2008; Hagedoorn and Hesen, 2007) have managed to secure such access. Investigating actual contract provisions and their corresponding functions would extend this research in a potentially fruitful direction.

Based on an inductive analysis, the proposition is that the impact of prior collaboration on the effectiveness of particular contractual configurations depends on the innovation context in which the collaborative NPD project is embedded. This implies that, as they engage in multiple collaborative NPD projects over time, partners could benefit from fundamentally changing the contract design in terms of governance functions. Nevertheless, the authors fully acknowledge that actually testing this proposition would require a more longitudinal research design.

To conclude, the research findings provide new insights into the governance of collaborative NPD and the role that contracts perform. The authors hope that their findings and suggestions for future research will inspire scholars to further explore the role of contracts in governing collaborative NPD in a wide variety of organizational settings, and that they will help practitioners to manage the governance challenges that are likely to emerge through such collaborative endeavors.

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