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Collaboration costs and new product development performance[☆]

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ABSTRACT

This study analyzes the relationships between governance in new product development collaboration, collaboration costs, and new product development performance. Data from new technology-based firms indicate that comprehensiveness in formal contractual governance has a stronger negative association with collaboration costs than relational governance does. In addition, collaboration costs relate negatively to new product development performance. This study contributes to understanding transaction costs within collaborative arrangements and the role of relational and formal governance in these arrangements.

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1. Introduction

The role of collaboration between firms in new product development is receiving increasing attention from scholars (Zhao, Cavusgil, & Cavusgil, 2014). New firms with resource constraints can access knowledge (Benavides-Espinosa & Ribeiro-Soriano, 2014) and numerous resources through collaboration. Collaboration can be beneficial for new technology-based firms, however, collaboration also poses many risks. These risks include possible loss of valuable knowledge (Parker, 2012), loss of time because of additional complexity in coordination, and potential predatory and opportunistic behavior of collaboration partners (Wallenberg & Schaffler, 2014). Although scholars widely report collaboration's benefits, few studies focus on collaboration's risks. This study addresses this research gap and focuses on understanding the risks in collaboration. In particular, the study investigates the risk of losing development time through the complexity of managing new product development collaboration. Losing time for new technology-based firms is serious because rapid development and first-mover advantages often determine product success. In such a time-pressured context, time losses can lead to collaborative development failure.

Optimal governance of collaboration is essential to reap the benefits of collaboration and minimize collaboration risks (Wallenberg &

Schaffler, 2014). Research on the governance of collaboration often emphasizes the value of relational governance (Leisching, Geigenmueller, & Lohmann, 2014). The singular focus on relational governance may be appropriate for long-term relationships but not for short-term relationships. Lambe, Spekman, and Hunt (2000) highlight the lack of research on the governance of short-term focused, interimistic relationships and discuss how governance may have different roles in short-term versus long-term relationships. This study addresses this gap and empirically examines the role of governance in short-term new product development collaboration. This study contributes to understanding collaboration in challenging, time-pressured environments (Zhao et al., 2014), where an asymmetry between the size of the new firm and the collaboration partner exists (Bazyar, Teimoury, Fesharaki, Moini, & Mohammadi, 2013).

Following this introduction, Section 2 contains the conceptual framework and hypotheses. Section 3 describes the methodology. Section 4 presents the results. Section 5 offers conclusions and then discusses theoretical and managerial implications.

2. Conceptual framework and hypotheses

2.1. Governance and collaboration costs

When new product development requires that two or more separate firms collaborate, new product development coordination challenges intensify significantly (Gerwin, 2004). Despite the significance of coordination costs in collaboration and the effect of governance on coordination costs, research examining this issue is sparse (Gulati & Singh, 1998).

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Theoretical discussions and empirical studies show divergent support for the effect of formal and relational governance on coordination costs. Transaction cost theory researchers (Williamson, 1985) recommend using formal controls to address coordination costs. Because of the vulnerability or liabilities of new firms, Stinchcombe (1965) recommends using contracts rather than relying on trust in collaboration. In time-pressured contexts, scholars suggest formal controls to clarify responsibilities and reduce confusion and collaboration costs (Bazyar et al., 2013). Consistent with transaction cost theory, this study proposes that greater comprehensiveness in the formal contractual governance structure correlates with lower levels of collaboration costs.

H1. Comprehensiveness in formal contractual governance presents a negative association with collaboration costs in new product development projects.

In contrast, relational exchange theory advocates emphasize the development of trust and relational norms to alleviate co-ordination concerns (Das & Teng, 2002). Arguments against using formal controls point out that creating and monitoring formal controls waste time and effort and that using relational controls is more time efficient (Lee & Cavusgil, 2006). Dyer and Singh (1998) suggest that coordination in the presence of relational controls is superior and that “self-enforcing safeguards” such as relational controls result in lower transaction costs than using formal controls does. Gulati and Singh (1998, p. 786) suggest that in innovation contexts “inter-firm trust can be an extraordinary lubricant for alliances that involve considerable interdependence and task coordination between partners.” Drawing on these views, which have their roots in relational exchange theory, this study proposes that higher levels of relational governance relate to lower levels of collaboration costs.

H2. Relational governance presents a negative association with collaboration costs in new product development projects.

2.2. Collaboration costs and new product development performance

In new product development, speed in developing new products is imperative for firms trying to gain a competitive advantage (Zhao et al., 2014). Reducing delays makes the new product development process more efficient and increases a firm's ability to achieve first-mover advantages, which has an association with greater profitability (Bazyar et al., 2013). This study proposes that high collaboration costs in the form of time losses relate to lower levels of new product development performance.

H3. Collaboration costs have a negative association with new product development performance.

3. Methods

In the first stage of this research, managers at ten new technology-based firms, five large established firms, and three law firms participated in interviews regarding their new product development collaboration experiences. In the second stage of this research, the survey sample comprised 1071 independent British firms operating in the computer and information processing, communication technology, and electronic instrumentation sectors. All firms were under 10 years old and had fewer than 100 employees (Yli-Renko, Autio, & Sapienza, 2001). The Financial Analysis Made Easy Database, which sources data from the Companies House registration lists, provided the information to create the sampling frame. From the sample, 729 firms were contactable, and the manager responsible for development received the survey. Respondents returned 124 responses, 110 of which were complete. Assessment of non-response bias showed that no significant

differences exist between early and late respondents (Armstrong & Overton, 1977).

3.1. Measures

The choice of measures for this study followed a rigorous search for measures in the literature. Next, feedback from the interviews helped to refine the measures. Exploratory factor analysis then yielded measures for the empirical analysis. Finally, a series of tests checked the validity and reliability of the measures. Likert scales (7-point) measured all items.

3.2. Relational governance

The measure for relational governance draws on Cannon and Perreault's (1999) work. The measure assesses the parties' willingness to make changes from the original agreement. Measures also assess the parties' willingness to support one another and act jointly for collaboration benefits. Finally, measures assess the parties' ability to deal constructively with conflict in the relationship. Cronbach's alpha for this 5-item measure is 0.75.

3.3. Formal contractual governance

The formal contractual governance measure draws on the work of Poppo and Zenger (2002) and the interviews described previously. This measure examines the level of detail in the contract and the level of clarity in project specifications such as roles, responsibilities, schedules, review points, and intellectual property ownership. Cronbach's alpha for this 4-item measure is 0.77.

3.4. Collaboration costs

The collaboration cost measure draws on Artz's (1999) work and the interviews. The collaboration cost measure assesses the degree to which transaction costs (i.e., time losses) appear because of the collaborative nature of new product development. Cronbach's alpha for this 3-item measure is 0.83.

3.5. New product development performance

The measure for new product development performance evaluates the projects' performance in terms of profitability and development time, building on the work of Olson, Walker, Ruekert, and Bonner (2001). Cronbach's alpha for this 3-item measure is 0.77.

3.6. Control variables

The interviews highlight the significance of firm size (number of employees), age (years since founding), and the size of the collaboration partner (number of employees). The analysis therefore includes these variables as control variables. The descriptive statistical analysis reveals that these variables have skewed distributions. Using the values' natural logarithm in the statistical analysis solves this problem (Hair, Anderson, Tatham, & Black, 1998).

4. Results and discussion

After confirming the reliability and validity of the measures, this study uses multivariate linear regression to examine the hypotheses (Lee & Cavusgil, 2006). The regression results (Table 1) show that formal contractual governance has a significant negative effect on collaboration costs (beta = -0.32 ; $p < 0.001$). These results validate H1. Results also validate H2, which predicts a negative association between relational governance and collaboration costs (beta = -0.14 ; $p < 0.01$). This relationship is weaker than the relationship in H1. The regression

Table 1
Results of regression analysis for governance, collaboration costs, and new product development performance.

Independent variables	Dependent variables	
	Collaboration costs	NPD performance
Formal governance	-0.32***	-
Relational governance	-0.14**	-
Collaboration costs	-	-0.25***
Firm age (log)	-0.22*	0.04
Firm size (log)	0.15	0.06
Collaboration partner size (log)	0.29**	0.19
F-statistic	16.51***	11.82***
R ²	0.30	0.23
Adjusted R ²	0.28	0.21

Figures in the table are standardized beta coefficients.

The p-values reflect one-tailed tests for hypothesized relationships.

n = 110.

* p < 0.05.

** p < 0.01.

*** p < 0.001.

results further show that collaboration partner size has a significant positive effect on collaboration costs (beta = 0.29; p < 0.01). This result indicates that collaborating with a larger partner causes the new technology-based firm to lose more time. This study also finds a negative association between firm age and collaboration costs (beta = -0.22; p < 0.05). This negative association suggests that older new technology-based firms may experience lower levels of time loss in new product development alliances than younger firms do. Results show that collaboration costs have a negative relationship with new product development performance (beta = -0.25; p < 0.001); hence, results support H3. Artz (1999) observes that if the costs of collaboration are excessive, they may offset any collaboration benefits.

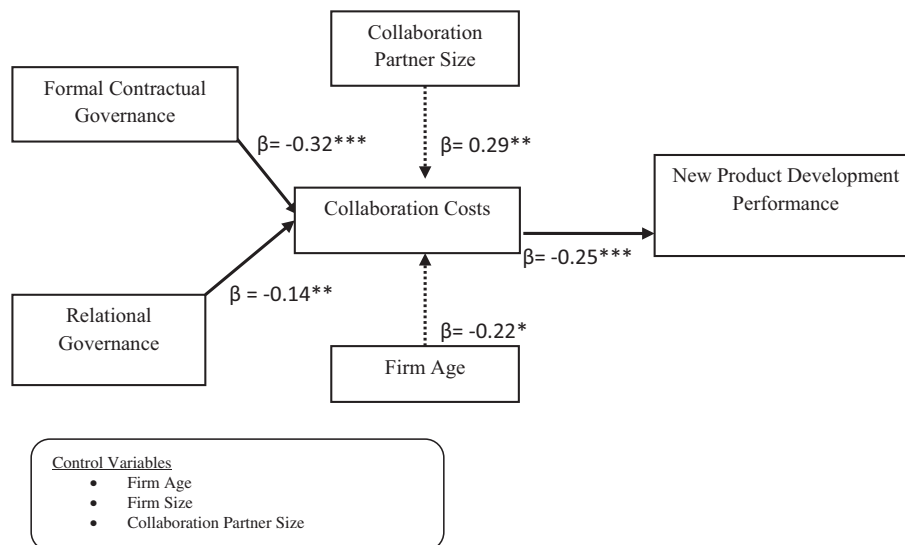
This study shows that formal governance has a stronger negative association with collaboration costs than relational governance has with collaboration costs. This result is surprising considering the number of relational theory researchers that argue that formal governance does not reduce collaboration costs; instead, formal governance increases collaboration costs because of the time firms expend in drafting and adjusting agreements (Artz, 1999). Dyer and Singh (1998) suggest that contracts constrain flexibility and result in higher coordination

costs. Relational governance's association with reduced collaboration costs corroborates findings in several studies and confirms the positive relationship between the development of relational norms and better collaboration performance. Regression results indicate that increasing collaboration partner size positively relates to collaboration costs. Small firms often find that they are in an inferior bargaining position than larger firms are. Hence, the large collaboration partner can impose terms that only benefit the larger firm (Bazyar et al., 2013). The regression analysis shows that the age of the new technology-based firm (in years since its establishment) has a negative association with collaboration costs. This negative association suggests that as new technology-based firms become older, they collaborate more and possibly start developing routines and processes that make collaboration more efficient and minimize time losses (Fig. 1).

5. Conclusions and implications

This study sheds light on how governance affects collaboration costs and new product development performance. This study responds to previous researchers' call for progress beyond conceptual discussions of transaction costs in collaboration and the development of more comprehensive measures of formal governance. The effects of collaboration partner's size and firm age support theories stressing the implications of power and size asymmetries in collaboration. Such effects emphasize the role of firm age and experience for new firms engaging in product development collaboration.

Six contributions arise from this research. (1) The operationalization of collaboration costs contributes to transaction cost theory by offering a measure of transaction costs, which scholars often discuss conceptually but rarely measure. (2) Developing a comprehensive measure for formal contractual governance (through extensive interviews with managers) allows this study to "develop more precise measures of contractual clauses" (Poppo & Zenger, 2002, p. 723). Poppo and Zenger (2002) report that using better measures for formal contractual governance is important to allow researchers to progress. (3) Evidence supports the role of formal contractual governance in reducing collaboration costs. (4) The finding that relational governance also relates to collaboration cost reduction supports the hypothesis that formal governance and relational governance work as complements rather than as substitutes. (5) The positive association between collaboration partner size and collaboration costs contributes to the literature on power



The standardised beta coefficients are shown.

*** p < 0.001; ** p < 0.01; * p < 0.05

Fig. 1. Relationships between governance, collaboration costs, and new product development.

relationships, which discusses collaborations between large and small firms and explores how this asymmetry in size can exacerbate time losses in collaboration. Finally, (6) the negative association between firm age and collaboration costs supports theories emphasizing the role of firm age and experience in reducing collaboration risks.

Managers at new firms often find contract creation daunting; this study's findings encourage new firms to write a contract that contains clear specifications of the project (e.g., roles, responsibilities, schedules, review points, and intellectual property ownership). This study shows that a well-specified contract facilitates coordination between firms and minimizes collaboration costs.

The new firm should develop a good relationship with its collaboration partner to reduce collaboration costs and improve new product development performance. Often, new firms are reluctant to spend time developing these relationships because these firms operate in time-pressured environments. However, managers must realize the benefits of developing a strong, trusting relationship to lessen time losses during collaboration.

A limitation of this study is the use of cross-sectional data; a future longitudinal study would provide a stronger test of causal relationships. Data collection from more diverse sectors and different countries would increase the result's generalizability. This study focuses on short-term new product development collaborations, but long-term inter-firm relationships differ from short-term relationships. Future research should establish the degree to which these findings are valid in long-term collaboration contexts.

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