



The interaction effect between intra-organizational and inter-organizational control on the project performance of new product development in open innovation ☆

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Abstract

The importance of control in the success of a project was clearly established in project literature. However, the impact mechanisms of intra-organizational and inter-organizational control on the performance of new product development (NPD) performance did not receive considerable attention in the increasingly important context of open innovation. To fill this gap, this study explores intra-organizational and inter-organizational control and their interaction effect on NPD performance in open innovation. The results show that intra-organizational formal control and inter-organizational trust positively influence NPD performance, whereas intra-organizational professional control and inter-organizational contract control have no significant effect. The interaction effect between inter-organizational and inter-organizational control positively influence NPD performance. These findings provide new insights into effective control practices for improving NPD project performance in open innovation.
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Keywords: Intra-organizational control; Inter-organizational control; New product development project performance; Open innovation

1. Introduction

In response to fast technological advancement and escalating costs, firms increasingly depend on external resources as they seek to serve complex and challenging demand (Cui and Wu, 2016; Wagner, 2012; Greitzer et al., 2010; Schleimer and Faems, 2016). The open innovation paradigm is increasingly becoming the main trend of new product development (NPD) activities. NPD is linked to a number of advantages in open innovation, such as increased product innovation output (e.g., Ritala, 2012), reduced costs (e.g., Luo et al., 2007), enhanced flexibility (Riege, 2003), and market expansion (e.g., Lai et al., 2014).

However, NPD projects in open innovation could also increase the complexity of management (Mikkola and Skjøtt-Larsen,

2006; Smets et al., 2016) and bring primary challenge because NPD projects are characterized by high levels of uncertainty, equivocality, and collaboration (Mishra and Shah, 2009). NPD projects are regarded as communication networks and problem-solving or decision-making chains (Song and Montoya-Weiss, 2001). Successful NPD projects in the context of open innovation require firms to develop routines and practices for coordination and collaboration with external sources, such as suppliers, customers, and internal cross-functions within a company. Major concerns involved in dealing with mixed relationships are behavioral or relational uncertainties induced by goal or incentive misalignment between parties (Das and Teng, 1996; White and Lui, 2005). Thus, effective control mechanisms should be considered (Tiwana and Keil, 2009; Handley and Benton, 2013).

However, the control mechanisms of intra-organizational and inter-organizational, and their effects on development performance were not sufficiently examined, and the relationship between the two aspects of control mechanisms are often

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ignored (e.g., Smets et al., 2016). Only a few studies examined the control mechanisms of NPD projects, and these studies separately discussed intra-organizational control (Liu and Wang, 2016; Liu, 2015; Korhonen et al., 2014) and inter-organizational control (Adler et al., 2016; Wu et al., 2017; Kalkman and Waard, 2017; Lu et al., 2015; Ning, 2017). For instance, Liu and Wang (2016) demonstrated the varying effectiveness of intra-organizational control (behavior, outcome, self-control and clan) and found that not all control modes significantly influence performance. Wu et al. (2017) explored the governance of inter-organizational innovation projects and the effects of factors on the performance of cooperative innovation projects.

According to resource-based theory (RBT), intra-organizational and inter-organizational control can be considered as unique kinds of ability that are useful in maintaining sustainable competitive advantages (Barney, 2012). Inter-organizational control could guide the partner behaviors, enhance external resource sharing and acquisition, and reduce cooperation cost, thereby contributing to the performance of NPD projects (Huang et al., 2014; Bunduchi, 2013; Wang et al., 2011). However, external resources are only useful when firms have the ability to utilize and allocate resources (Barney, 1991; Wernerfelt, 1984). Intra-organizational control affects the efficiency of resource utilization (Evanschitzky et al., 2012; Liu et al., 2011). The effectiveness of inter-organizational resource depends on the level of intra-organizational control. Thus, inter-organizational and intra-organizational control should be considered simultaneously in NPD projects, including the effect of their interaction on the performance of NPD projects.

Considering that the impact mechanisms of intra-organizational and inter-organizational control on the performance of NPD performance did not receive considerable attention in the increasingly important context of open innovation. To fill this gap, this study aims to empirically test the effect of intra-organizational control and inter-organizational control on NPD project performance, and further explore the interaction effect between them in open innovation. We use project-level data collected from 243 samples from the manufacturing industry in China to examine our conceptual framework. This study is arranged as follows. First, related concepts and existing studies on control of NPD projects are reviewed. Second, the research model is developed and the hypotheses are presented. Third, the methodology is described, including sampling and data collection procedures, measurements, and instruments. The hypotheses are then empirically tested and the analysis results are presented. Finally, this study proposes theoretical and practical implications, limitations, and future research directions.

2. Literature review

2.1. NPD project in open innovation

NPD project pertains to the process of linking technology and customer needs (Dougherty, 1992) and involves a series of multifaceted and complex activities. This process was summarized as a series of stages from idea generation to commercialization. For example, Cooper (2008) reported the following stages: idea

screening, business analysis, technical development, testing validation, and product launch. A NPD project should be effectively managed to ensure its success. This goal can be accomplished through the appropriate application and integration of project management process groups involving initiation, planning, execution, monitoring, control, and closing (PMBOK, 2013).

Traditional NPD projects are implemented within firm boundaries. Technological changes accelerate with the intensified global competition, which rapidly changes customer preferences and shortens the life cycles of new products (Menon et al., 2002). Firms are interested in the open innovation paradigm and the involvement of external parties in NPD projects (Cui and Wu, 2016; Wagner, 2012; Greitzer et al., 2010; Chesbrough, 2003).

NPD projects in open innovation are specific projects designed to create a new product that can meet customer demands through cooperation with other firms such as suppliers, customers, competitors and public research organizations such as institutes and universities (Bosch-Sijtsema and Postma, 2008; Wu et al., 2017). Focal firms in NPD projects may be involved in different firm functions such as marketing, R&D, purchasing, operation, finances and external sources such as suppliers and customers. Appropriate organizational controls are essential in reconciling the interests of parties (Gopal and Gosain, 2010), which could foster coordination and cooperative behavior (Smets et al., 2016).

2.2. Organizational control mechanisms in open innovation

Control is defined as the rules and processes that govern the actions of partners to foster desirable behaviors (Tiwana, 2008). Managerial control involves the controller and contreee. The controller is responsible for designing and implementing specific control modes, whereas the contreee is influenced by the control exerted by the controller (Kirsch et al., 2010). In the present study, we consider focal firms or team managers as controller, who provide supervision of NPD projects from the project owners' perspective. Members of the development team and cooperating firms are regarded as contreees.

Open innovation has two aspects of control, namely, intra-organizational and inter-organizational controls. Obvious differences exist between intra-organizational and inter-organizational control. The first difference is control spans, wherein the former exists across departments in one company, but the latter exists across company boundaries. The second difference is the controller–contreee relationship, wherein the former can be found in organizational departments within the same organization, but the latter exists as two or more independent contract-based organizations (Tiwana and Keil, 2009).

Control is implemented through a variety of control mechanisms. Intra-organizational control includes formal control and informal professional control (Choudhury and Sabherwal, 2003). Formal control involves setting project goals and monitoring and providing feedback on partners' behaviors in the NPD process (Keil et al., 2013). For example, firms tend to predefine and prescribe project goals, procedures, and important delivery nodes, as well as supervise each partner's behavior in

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