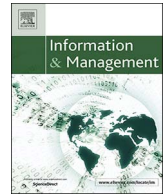




Contents lists available at ScienceDirect

Information & Management

journal homepage: www.elsevier.com/locate/im

Exploring ideation and implementation openness in open innovation projects: IT-enabled absorptive capacity perspective

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ARTICLE INFO

Keywords:

Open innovation projects
IT-enabled absorptive capacity
Ideation openness
Implementation openness
Product innovativeness
Speed to market

ABSTRACT

Advancements in information technology (IT) have made organizational boundaries so porous, thereby resulting in a trend toward leveraging external knowledge for innovation. However, firms experience significant obstacles in drawing external knowledge. This study aims to disentangle the role of IT-enabled absorptive capacity in new product development performance. The research model was tested with survey data of open innovation projects from 152 firms. Our findings indicate that IT-enabled absorptive capacity improves open innovation project performance in terms of new product innovativeness and product speed to market, but we do not detect a significant direct influence of openness on performance. Our findings also show that the interaction of IT-enabled absorptive capacity and ideation openness significantly amplifies new product innovativeness while the interaction of IT-enabled absorptive capacity and implementation openness accelerates the product speed to market. This study theoretically contributes by building an IT-enabled absorptive capacity theory in the open innovation context and uncovering the effects of two dimensions of openness. In practice, it offers managers strategies to successfully conduct open innovation projects in deploying effective ITs and leveraging various types of openness during the two phases.

1. Introduction

The mobility of knowledge workers, velocity of technological changes, and globalization of markets have shifted the way in which innovations are created in organizations. While organizations are used to developing new technologies internally and transferring these to their own products and services in a practice called “closed innovation,” an increasing trend of leveraging external knowledge for innovation exists. “The use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively” is termed as “open innovation” [1, p. 1]. With the proliferation of interconnectivity and interactivity through information technology (IT), organizations now frequently engage in open innovation with customers, suppliers, universities, research institutions, and other sources of knowledge [2]. Such emerging innovations can bring significant benefits to organizations. Primarily, organizations can obtain complementary knowledge from collaborative partners, thereby encouraging creativity and novel solutions and resulting in the rise of new technologies or new market possibilities. Several pioneering companies, such as Procter & Gamble, General

Electric, IBM, and Siemens, have obtained benefits from pursuing open innovation strategies. For instance, Procter & Gamble collaborates with external innovators on more than 35% of its new products through its “Connect and Development” program, and its research and development (R&D) productivity has increased by nearly 60% [3].

By using external knowledge, organizations expect to introduce more innovative products and accelerate their innovation process [4,5]. Despite the promising benefits, many other adopting organizations experience significant difficulties in profiting from external knowledge [6,3]. Open innovation brings complexity and difficulty into the innovation process, which leads to increased risks to the project performance [7]. Firms encounter challenges in knowledge acquisition, exchange, integration, and coordination with their partners [1,8,9].

The open innovation phenomenon has been drawing attention from academics. Identifying a theoretically driven way to address the challenges of open innovation is important not only to help firms seize the potential of open innovation but also to advance the extant literature. Evidence shows that IT could enable the exploration, creation, dissemination, and use of knowledge [10] and can facilitate the open innovation strategies of firms. For instance, organizations largely depend

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<https://doi.org/10.1016/j.im.2017.12.002>

Received 22 August 2016; Received in revised form 2 November 2017; Accepted 8 December 2017
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on social media tools or business analytics to search for useful external technology [11]. Collaborative innovation IT systems are used to support knowledge exchange between firms [12]. We propose that *IT-enabled absorptive capacity*, which is defined as a firm's ability to employ IT-based resources with other resources in building organizational capability in knowledge acquisition, assimilation, transformation, and exploitation [13,14], is a useful theoretical lens for understanding how IT can help overcome the challenges in open innovation. By engaging in interlinked processes that enable high-quality knowledge sharing and processing, IT-enabled absorptive capacity enhances knowledge transfer at the inter-organizational level, thereby resulting in improved knowledge recombination and creation [15].

Openness benefits firms through “technological fusion,” which is the combination of existing technologies from several resources, and the powerful market effects these combinations can create [16]. Innovation openness has substantial potential to contribute to innovation outcome [7]. Prior literature on open innovation suggests that organizations may engage in different degrees of openness for innovation purposes [8,17], thereby resulting in varying performance of open innovation projects. Moreover, the development of innovations is comprised of two different phases: 1) idea generation and 2) idea implementation [18,19]. The study of value constellations shows that the open innovation openness is also important for the innovation idea implementation [20]; however, innovation openness during the idea implementation phase has been overlooked in prior literature and is not yet integrated into the broader context of open innovation. The idea generation phase is characterized as the initial conceptualization and development of new product idea and prototype. During the idea implementation phase, the focus is to transform the finalized product idea and prototype into an actual product. These two phases entail their own different characteristics; consequently, being open in these two phases may yield different innovation outcomes. To provide executives with actionable guidance for managing open innovation projects, a deeper exploration is needed to untangle the impacts of openness. Thus, it is important to distinguish implementation and ideation openness and explore their distinct effects on open innovation performance.

Furthermore, several previous studies pointed out the important interaction effect of IT and other firm resources in achieving organizational performance [21,22]. Integrating IT with other complementary organizational resources obtains a highly comprehensive understanding of its effects on open innovation performance. As innovation openness enables firms to access external knowledge resources, we expect that the extent of how knowledge is assimilated and exploited by IT-enabled absorptive capacity can benefit open innovation outcomes subject to such different nature. Considering that two important measures of open innovation outcomes are product innovativeness and speed to market (e.g., [23,24]), this study aims to answer the following research questions:

- (1) *What is the role of IT-enabled absorptive capacity on open innovation project performance in terms of new product innovativeness and speed to market?*
- (2) *How do ideation openness and implementation openness affect innovation performance (i.e., product innovativeness and speed to market)?*
- (3) *How can the two dimensions of openness differently influence the effects of IT-enabled absorptive capacity on new product innovativeness and speed to market?*

To answer these questions, we draw on the notion of organizational absorptive capacity and organizational learning literature. Specifically, the current study differentiates two dimensions of open innovation openness, namely, ideation openness and implementation openness, and examines their interaction effects with IT-enabled absorptive capacity on the product innovativeness and speed to market. These two phases entail their own different characteristics, objectives and focuses; consequently, being open in these two phases may yield different

innovation outcomes. In the idea generation phase, the idea has not been finalized and the inputs from external knowledge sources can influence the conceptual innovativeness of the idea and solution. High ideation openness increases the exposure of the innovation project team to complementary and diverse knowledge [8]. Ideation openness provides a substantial amount of inputs for IT to extract value from. As IT-enabled absorptive capacity facilitates the innovation team to identify and absorb the right knowledge, high ideation openness provides innovating firms with the opportunity to fully realize the potential of IT. Thus, ideation openness strengthens the positive influence of IT-enabled absorptive capacity on project idea development. In the idea implementation phase, the new product idea has been finalized and the prototype has been developed. The knowledge recombination occurs at an incremental pace and may not lead to very creative ideas. Consequently, it will not significantly influence the innovativeness of the new product. Instead, tasks in the implementation phase are more standardized and modular. This process can be sped up by dividing tasks into smaller components and relying on specialists to work on each diverse technological area [25]. IT-enabled absorptive capacity and implementation openness together provide complementary capabilities and generate benefits through economies of specialization from diverse external knowledge sources [26]. This approach hence enables the innovation team to save a considerable amount of time in project development. Therefore, we expect that ideation openness can improve product innovativeness while implementation openness strengthens the speed to market. They also have different interaction effects with IT-enabled absorptive capacity on the two performance measures. Hypotheses are empirically tested through survey data collected from 152 firms regarding their identified open innovation projects. Our study findings contribute to efforts in open innovation and to the literature on IT and innovation. From a practical perspective, the findings specify managerial guidelines on how to effectively improve new product innovativeness and speed to market during each phase of an open innovation project. An appreciation of the roles of IT-enabled absorptive capacity in open innovation projects can help organizations mindfully invest in IT and deploy it in future endeavors.

The rest of this study is organized as follows. First, a theoretical framework is developed to explore IT-enabled absorptive capacity and its effect on new product innovativeness and speed to market. The effects of ideation openness and implementation openness and their interaction effects with IT-enabled absorptive capacity are also addressed. Second, the empirical context and data collection procedures are described, followed by data analysis and presentation of results. Finally, the theoretical and empirical implications are discussed, as well as limitations and future research directions.

2. Theoretical foundation and hypotheses

2.1. Open innovation project openness

The past decades witnessed a transition from closed innovation to an open innovation model, where firms frequently engage in collaborative innovations with customers, suppliers, universities, research institutions, and other sources of knowledge [2]. Compared with traditional closed innovation, open innovation models highlight the interactive and distributed nature of innovation [27]. The central premise of open innovation is to open up the innovation process and leverage external knowledge for innovation success [1].

The concept of openness has drawn extensive attention from researchers and has been studied in different contexts. For example, by investigating online open-innovation platforms, [28] conceptualized and operationalized platform openness from the perspective of application developers. [29] focuses on openness as revealing ideas that are previously hidden inside organizations. Innovation openness has substantial potential to contribute to innovation outcome [7]. Prior open innovation literature (e.g., [30]) emphasizes why organizations acquire

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