Leveraging Structural Holes For Innovation: The Moderating Effects Of IT-Enabled Absorptive Capacity

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LEVERAGING STRUCTURAL HOLES FOR INNOVATION: THE MODERATING EFFECTS OF IT-ENABLED ABSORPTIVE CAPACITY

(Research in Progress)

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Abstract

Innovation has been a topic of considerable interest to researchers and practitioners. Particularly, the networks within which firms operate and their properties (e.g., structural holes) are suggested to affect firms’ innovation performance. One stream of research finds that structural holes are conducive to firms’ innovation because of the heterogeneous information about alternatives that firms can obtain through spanning structural holes. Another stream of research finds that structural holes inhibit knowledge transfer from knowledge sources and hence deter firms to innovate. This study aims to reconcile the two conflicting streams of research by identifying the conditions under which structural holes will be conducive to organizational innovation. Based on structural holes theory and absorptive capacity literature, this paper constructs a model to explain the moderating effects of IT-enabled absorptive capacity on the relationship between structural holes and organizational innovation performance. This paper proposes that independently, structural holes may not influence innovation performance. However, when the exploration and transformation dimensions of IT-enabled absorptive capacity are high, structural holes should positively affect innovation performance. Also, the exploitation dimension should positively affect innovation performance. The proposed methodology, measurement, and potential contributions of the study are discussed.

Keywords: Structural Holes, IT-enabled Absorptive Capacity, Innovation Performance
1. INTRODUCTION

Innovation has been recognized as playing a central role in the long-term survival of organizations (Lichtenthaler 2009). It serves as a strategy for organizations to adapt to environmental dynamism and to obtain competitive advantage by providing new products or services to underserved or unserved customers (Huston and Sakkab 2006). Also, it can create value for companies by decreasing the costs of existing products or services, improving their quality, or delivering better business or delivery models (e.g., Clemons and Row 1991; Hauser et al. 2006). Further, radical innovations transform or even destroy existing markets by finding new solutions to problems. They can bring down giant incumbents and propel small start-ups into dominant positions creating new jobs for the market (Hauser et al. 2006). With such potential benefits, innovation has aroused continuing interest among researchers and practitioners (e.g., Chesbrough 2003; Lichtenthaler 2009).

Following Schumpeter (1934), researchers have treated innovation in organizations as a process of creating new social connections between people, and the ideas and resources they carry, so as to produce novel combinations (Hargadon 2003; Obstfeld 2005). If recombination is the key to innovation, then social network activity may be an important predictor of organizations’ innovation behavior (Nahapiet and Ghoshal 1998). For instance, every year, P&G invests more than 2 billion dollars in innovation and more than half of its innovations come from its global network of external innovation partners.

How do organizational relational networks contribute to innovation? To address this question, scholars have analyzed the influence of network properties, in particular, investigating the influence of structural holes on firms’ innovation performance (e.g. Ahuja 2000; Zaheer and Bell 2005). Researchers suggest that firms are able to obtain a heterogeneous knowledge flow from their networks through spanning the structural holes (Zaheer and Bell 2005). The heterogeneous knowledge obtained will enable firms to unlock internal capability rigidities and to innovate through utilizing existing knowledge in a new manner (Burt 1992, 2004).

However, previous empirical studies have obtained mixed results regarding the influence of structural holes on innovation performance (e.g., Ahuja 2000; Burt 2004; Chi et al. 2010; Rodan and Galunic 2004; Zaheer and Bell 2005). For example, Zaheer and Bell (2005) found that firms that span multiple structural holes are more likely to have superior innovation performance. However, Ahuja (2000) reported a different result from his longitudinal study of firms in the global chemical industry. He found that structural holes have a negative effect on innovation. Similar results have also been reported in Fritsch and Kauffeld-Monz (2008) and Shipilov (2009).

Researchers have argued that this could be due to the fact that firms encounter substantial challenges in transferring the knowledge from structural holes to internal R&D (Fritsch and Kauffeld-Monz 2008; Hansen 1999; Inkpen and Tsang 2005), although structural holes are conducive for firms to obtain heterogeneous information, become aware of alternatives, and generate new ideas (Burt 2004; Chi et al. 2010). The dispersed, unconnected organizations around structural holes are inherently more difficult to mobilize for novel ideas (Granovetter 2005; Shipilov 2009). The difficulty in mobilizing external knowledge and capabilities derives from a lack of common knowledge and understanding among those organizations around structural holes (Ahuja 2000; Gulati 1998). Moreover, organizations surrounding structural holes typically have different interests, employ different languages and adopt different organizational structures (Hansen 1999; Shipilov 2009). As a result, these challenges can prevent firms from benefiting from spanning structural holes.

These mixed empirical results have confused researchers and practitioners on whether structural holes will or will not enhance organizational innovation. Motivated thus, this paper aims to reconcile the conflicting results by identifying the specific conditions under which structural holes are conducive to innovation performance. We argue that just connecting to networks does not guarantee successful knowledge transfer from knowledge sources to seekers and thereby enhance seekers innovation.
performance (Laursen and Salter 2006). While structural holes lead to good ideas, there has been no evidence that these ideas lead to implementation efforts, let alone implementation success (Burt 2004). Rather absorptive capacity matters in converting external knowledge to innovation outcomes (Cohen and Levinthal 1990; Shipilov 2009). We propose that when organizational absorptive capacity is high, structural holes will be positively related to innovation performance.

Absorptive capacity refers to organizations’ capability to recognize, assimilate, transform, and exploit external knowledge for creating and implementing new ideas (Zahra and George 2002). Since firms are increasingly using knowledge management systems and other information technologies (Kankanhalli et al. 2005), they are relying on these technologies to develop and maintain their absorptive capacity and apply it for innovation (Dodgson et al. 2006). For example, to retain knowledge from retiring scientists, NASA has adopted multiple information technologies including knowledge management systems, data mining tools, and expert systems. Consequently, Joshi et al. (2010) introduced the concept of IT-enabled absorptive capacity as the capability provided by information technologies to absorb new knowledge. Joshi et al. (2010) argued that information technologies enable firms to better renew, manage, and apply their knowledge base for innovation. They found that IT-enabled absorptive capacity positively affect firms’ innovation performance. Similarly, Chi et al. (2010) found that IT-enabled absorptive capacity enables firms to carry out competitive actions including innovation. However, there is limited research and understanding of the relationships between structural holes, IT-enabled absorptive capacity, and innovation performance (Chi et al. 2010). In this study, we aim to explore the role of information technologies in allowing knowledge from around structural holes to be leveraged for innovation. Following Chi et al. (2010) and Joshi et al. (2010), we consider IT-enabled absorptive capacity as a relevant factor that influences innovation performance.

Based on the structural holes theory and absorptive capacity literature, we propose that the influence of structural holes on innovation performance will be dependent on the level of IT-enabled absorptive capacity. The proposed model is shown in Figure 1.

![Figure 1. Proposed Research Model](image)

2. THEORIES AND HYPOTHESES

2.1 STRUCTURAL HOLES

Past literature on networks and innovation at the inter-firm level can be classified along two streams of research (e.g., Burt 1992; Adler and Kwon 2002). One stream of research stresses the benefits of “closed”, dense, or cohesive networks (e.g., Coleman 1988), including cooperation, trust, and the potential to build knowledge through intensive, repeated interactions and exchange of ideas (e.g., Ahuja 2000). These studies hold that extensive relations between partners can foster the development of shared norms of behavior and explicit inter-organizational knowledge-sharing routines (Uzzi 1997). Dense networks (networks with less structural holes) can also foster fine-grained information transfer and joint problem solving (Uzzi 1997). However, this stream of research has been criticized for its ineffectiveness in explaining firms’ innovation performance (Ahuja 2000; Zaheer and Bell 2005).

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2 [http://km.nasa.gov/technology/index.html](http://km.nasa.gov/technology/index.html)
This is because information shared in networks with few structural holes is often redundant and may not be conducive to organizational innovation.

The other stream of research emphasizes the role of structural holes in innovation. Structural holes refer to network structures in which two otherwise disconnected firms in the network are only connected through a broker firm (Burt 2004). The broker firm serves as a third referral (bridging ties) and helps connect two separate firms positioned around structural holes (Shipilov 2009). According to structural holes theory, structural holes enable broker firms to obtain more heterogeneous sources of knowledge for innovation by exposing them to novel communities, diverse experiences, unique resources, varying preferences, and multiple thought worlds, rendering superior opportunities to access alternative ways of thinking and hence to innovate (Burt 1992, 2004). Networks rich in structural holes imply a high probability of accessing mutually unconnected partners and, consequently, obtaining distinct information flows for broker firms (Zaheer and Bell 2005). These diverse information flows provide alternative ways to recombine existing knowledge with new knowledge or reconfigure existing knowledge in a new pattern. Consequently, innovations are likely to emerge from these knowledge recombinations or reconfigurations (Hargadon and Sutton 1997). Thus, maximizing the structural holes spanned or minimizing redundancy between partners is an important aspect of constructing an efficient, knowledge-rich network for innovation (Burt 1992).

However, when innovation activities are more concerned with creating and mobilizing complex forms of knowledge, rather than the simple transfer of information, networks with less structural holes would appear to become particularly important for organizational innovation performance (Hansen 1999). This is because a network with less structural holes presents less inherent conflict between knowledge sources and seeker firms (Brown and Duguid 2001). Seeker firms can obtain fine-grained knowledge from source firms and hence are able to form new capabilities for innovation. In contrast, firms spanning many structural holes are likely to obtain heterogeneous information. However, these firms may not be able to obtain detailed technical knowledge and capabilities from sources by spanning structural holes (Ahuja 2000) since there is a lack of reciprocity and norms among firms around structural holes (Burt 1992). Also, firms may lack prior knowledge to absorb the new knowledge from structural holes for innovation since firms around the structural holes lack a common language or practice (Gulati 1998). With the countervailing effects, we hypothesize:

**Hypothesis 1**: The extent of structural holes that a firm spanned may either positively affect or not affect its innovation performance

### 2.2 IT-enabled Absorptive Capacity

The concept of absorptive capacity was first introduced by Cohen and Levinthal (1990) to describe the capabilities of the firm to innovate. It consists of the capabilities to recognize the value of new knowledge, to assimilate it, and to apply it to commercial ends. As a by-product of organizational R&D, absorptive capacity influences the innovation performance of the firm by quickly recognizing, assimilating, and applying it into new product development processes. The basic assumption of this concept is that prior related knowledge determines a firm’s level of absorptive capacity (Cohen and Levinthal 1990; Lane et al. 2006). Firms need some knowledge overlap with an external knowledge source to successfully absorb new knowledge, but a very strong overlap limits the possibilities of gaining new insights (Lord and Ranft 2000). Subsequently, Zahra and George (2002) reconceptualised this concept as a dynamic capability that includes knowledge acquisition, assimilation, transformation, and exploitation capabilities. Based on Zahra and George (2002) and Cohen and Levinthal (1990), Todorova and Durisin (2007) reintroduced the capability of recognizing the value of knowledge as a dimension of absorptive capacity and explicated the relationship between assimilation and transformation capabilities relying on cognition learning literature. The Todorova and Durisin (2007) suggested that the relationship between different dimensions of absorptive capacity is not linear at all and the transition between transformation and assimilation should be an interactive process that reinforces each other.
Alternatively, Lane et al. (2006) reconceptualized absorptive capacity based on the organizational learning view. After combining the insights from past literature and Cohen and Levinthal’s (1990) definition of absorptive capacity, Lane et al. (2006) defined absorptive capacity as a firm’s ability to utilize externally held knowledge through three sequential processes: (1) recognizing and acquiring potentially valuable new knowledge from outside the firm through exploratory learning, (2) assimilating valuable new knowledge through transformative learning, and (3) using the assimilated knowledge to create new knowledge and commercial outputs through exploitation learning. Lane et al. (2006) propose that a firm’s stock of prior knowledge constitutes the basis for knowledge flows among the three learning processes. This conceptualization is supported by Lichtenthaler (2009), who found that each dimension complements the others to enhance organizational innovation. Recently, Joshi et al. (2010) have introduced the concept of IT-enabled absorptive capacity based on the capability provided by information technologies to search, store, and integrate new knowledge. We adopt Joshi et al. (2010)’ conceptualization of IT-enabled absorptive capacity for our study. Following Lichtenthaler (2009), we conceptualize IT-enabled absorptive capacity as consisting of dimensions of IT-enabled exploration, transformation and exploitation capabilities.

2.2.1 IT-enabled Exploration Capability

Information technologies that help support knowledge recognition and acquisition provide IT-enabled exploration capability. Knowledge exploration capability refers to firms’ capability to identify and obtain knowledge that is critical to their operations (Cohen and Levinthal 1990) and to unlock internal knowledge for innovation (Lane et al. 2006). For exploratory capability, prior related knowledge is essential. It helps firms to recognize relevant external knowledge sources and to acquire this knowledge (Zahra and George 2002). Based on prior knowledge, exploratory capability reconfigures a firm’s knowledge base (Garud and Nayyar 1994; March 1991). A high level of exploratory capability helps firms to acquire external knowledge and to sustain superior performance based on first mover advantage, strategic flexibility, responsiveness to customers, and avoidance of “lock-out effects” and “competency traps” (Leonard-Barton 1992; Zahra and George 2002).

Starting with a knowledge need, many firms have established scanning mechanisms to recognize external knowledge sources (Cohen and Levinthal 1990). These searching and acquiring activities are usually supported by information technologies. These technologies can enhance firms’ speed of identifying relevant knowledge and increase the volume of knowledge scanned (Joshi et al. 2010). These tools could include business intelligence systems (Joshi et al. 2010), search engines (Dodgson et al. 2006), online knowledge markets such as Innocentive (Jeppesen and Lakhani 2010), and electronic knowledge management systems (Kankanhalli et al. 2005). Firms with high IT-enabled exploration capability can better search the heterogeneous information from structural holes (Burt 1992). This is because these technologies enable firms to access relevant knowledge from external sources with higher speed and intensity. For example, firms can acquire external heterogeneous knowledge by matching them with preset keywords in searching technologies (Dodgson et al. 2006).

In accordance with research on innovation (e.g., Jansen et al. 2005; Shipilov 2009), we expect that structural holes contribute to innovation and performance under the condition of high IT-enabled exploratory capability. For relatively low IT-enabled exploratory capability, this positive effect will be less strong or may be neutralized as argued in Hypothesis 1 because firms cannot capture the heterogeneous knowledge from structural holes due to their inability to recognize the value of the knowledge and to acquire the knowledge (Lichtenthaler 2009; Lane et al. 2006). This suggests that:

**Hypothesis 2a:** Under conditions of high IT-enabled exploration capability, the extent of structural holes that firms spanned positively affects their innovation performance

2.2.2 IT-enabled Transformation Capability

Information technologies that help support knowledge transformation and retention provide IT-enabled transformation capability. Transformation capability is the capability of localizing external knowledge to organizational contexts and assimilating it into the knowledge base. Transformation
capability is key for organizations to ensure returns from exploration and avoid the costs of overly-relying on exploitation for organization innovation (Argote et al. 2003; Lane et al. 2006). It is a critical capability for firms to not only convert external knowledge for local problems but also to reactivate existing knowledge for new problems. This is because assimilated knowledge sometimes has to be maintained for years until it is finally applied in new products (March 1991; Rothaermel and Deeds 2004). To avoid losing skills and routines, firms must actively manage knowledge retention to keep assimilated knowledge “alive” (Lane et al., 2006). For subsequent exploitation, the maintained knowledge has to be reactivated by internalizing it again through experience (Argote et al. 2003). The failure to maintain and reactivate knowledge may have detrimental effects on the organizational knowledge base and hence innovation performance (Argote et al. 2003; Marsh and Stock 2006).

Moreover, prior knowledge is important for transformation capability. To successfully retain knowledge, firms need sufficient prior knowledge (Marsh and Stock 2006; Teece 2007). Relevant knowledge is important for deciding to maintain knowledge, for combining it with other knowledge, and for reactivating it (Marsh and Stock 2006). The more related knowledge a firm has, the easier it is for it to maintain and reactivate additional knowledge. Firms with prior relevant knowledge may flexibly adapt to environmental changes and avoid core rigidities by maintaining a large knowledge base (Teece 2007). As transformative capability affects the knowledge stock that may be applied in innovation, it is imperative for achieving superior innovation and performance based on retaining assimilated knowledge (Garud and Nayyar 1994; Lane et al. 2006).

There are a number of information technologies that can help firms retain and reactivate knowledge for innovation. These technologies include electronic knowledge management systems (Kankanhalli et al. 2005), and electronic communities for interaction and communication (Wasko and Faraj 2005). These technologies can not only retain organizational knowledge but also facilitate employees to reactivate the knowledge for current projects (Wasko and Faraj 2005). They can help firms retain prior knowledge, quickly search relevant background information for external knowledge, and facilitate employees to communicate and articulate knowledge for each other. For example, employees who encounter a complex problem may directly contact those who have tackled similar problems before through the expert finding function in the systems or posting questions in the community forum.

Prior research suggests that external knowledge acquisition per se is insufficient through weakly connected networks (Granovetter 2005). New knowledge is often cumulatively generated and assimilated based on existing knowledge (Kogut and Zander 1992). This path dependent development of knowledge suggests that transformation capability becomes more important as structural holes increase (Burt 2004). Information technologies facilitate the acquisition and transformation of additional external knowledge obtained through spanning structural holes through preset searching keywords. A high IT-enabled transformation capability enables firms to retain their knowledge and reactivate existing knowledge for solving problems in new contexts. Following the logic discussed above, we expect that structural holes have a positive effect in companies with high IT-enabled transformation capability.

**Hypothesis 2b:** Under conditions of high IT-enabled transformation capability, the extent of structural holes that a firm spanned positively affects its innovation performance

### 2.2.3 IT-enabled Exploitation Capability

Information technologies that help support firms to better apply their internal knowledge base for production provide IT-enabled exploitation capability. IT-enabled exploitation capability focuses on applying knowledge in the context of new product or service development with the help of information technologies (Joshi et al. 2010). It goes beyond assimilating external knowledge (Lane et al. 2006). In particular, exploitation capability is associated with matching knowledge and markets (Lenox and King 2004; Rothaermel and Deeds 2004).
Firms with high exploitation capability may achieve superior performance by using assimilated knowledge in the innovation processes (Zahra and George 2002). This is supported by the empirical study conducted by Jansen et al. (2005), who found that the exploitation capability directly affects innovation by relying on the performance of the previous two capabilities i.e. exploration and transformation capability. Besides, exploitation capability enables firms to develop new perceptual schemata for product development (Jansen et al. 2005). Beyond matching knowledge with problems, exploitation capability converts knowledge into new products (Tsai 2001). By acquiring external knowledge, firms renew their knowledge bases, which are further utilized by firms with the help of their exploitation capability.

Based on market knowledge, exploitation capability determines to what degree assimilated knowledge is converted into new products (Zahra and George 2002). However, a high level of internal exploitation may lead to an overemphasis on existing markets and technologies, which are less valued in a rapidly changing environment (Levinthal and March 1993). Moreover, firms likely do not develop high levels of exploitation capability to apply assimilated knowledge if they lack sufficient levels of the other capabilities to renew and maintain their knowledge base in the first place (Lane et al. 2006). Accordingly, the risks of excessive levels of exploitation capability are likely in the context of a dense network or in a dynamic environment (Jansen et al. 2005; Lichtenthaler 2009; Zahra and George 2002). As exploitation capability is critical to profiting from assimilated knowledge, its importance is likely to increase in structural holes settings (Cassiman and Veugelers 2006). Firms can strongly rely on external knowledge for innovation, which mitigates the risks of over-relying on exploitation capability.

However, exploitation capability is close to production and innovation. Researchers argue that in most cases, exploitation capability is directly related to innovation rather than moderated by the external environment (e.g., Lichtenthaler 2009; Obstfeld 2005). For example, Jansen et al. (2005) found that firm exploitation capability directly affects innovation by relying on the performance of the exploration capability. Hence, we posit that exploitation directly affects innovation performance. Exploitation capability can be enhanced or enabled through IT. IT can help firms apply knowledge for production through merging, categorizing, reclassifying, and synthesizing existing knowledge (Joshi et al. 2010). Such technologies include data mining and analytical software and visualization technology. For example, visualization technologies can support bisociation by integrating and mapping disparate knowledge sets to uncover new patterns of knowledge application for innovation (Dodgson et al. 2006). Based on the above discussion, we hypothesize that:

**Hypothesis 2c: IT-enabled exploitation capability positively affects a firm’s innovation performance**

### 3. METHODS AND OPERATIONALIZATION

We will target firms from the InformationWeek 500 (IW500) to test our model, as done in previous innovation studies (Chi et al 2008). The reason for choosing this list as the sampling frame is that InformationWeek reports IT use of firms to inform us about the IT-enabled capabilities. The collaboration information of these firms can be obtained through InformationWeek 500 and from firms’ published information for stake-holders. Additionally, a survey will be conducted to collect data for the dimensions of IT-enabled absorptive capacity. The key informants for the survey will be the R&D managers and production managers in the target firms.

Following Joshi et al. (2010), we will use objective data to measure innovation performance, i.e. the number of patents and the number of new products/services introduced to the market in a given year. This is because secondary objective data can increase the validity and robustness of results, and reduce the influence of common method variance that exists in studies relying on a survey as the single data source (Podsakoff et al. 2003).

We will use the ratio of non-redundant contacts to total contacts for the $i^{th}$ firm to measure the structural holes in the network of the firm as suggested by Burt (1992). This measure is computed as...
\[ \sum [1 - \sum_{q} \beta_{i,j}^{q} + M_{j}^{q}] / C_{i} \], where \( p_{j}^{q} \) is the proportion of \( i \)'s relations invested in the connection with contact \( q \), \( m_{j}^{q} \) is the marginal strength of the relationship between contact \( j \) and contact \( q \), and \( C_{i} \) is the total number of contacts for firm \( i \). Higher values on this index reflect firms whose networks are rich in structural holes, i.e., the firms' partners are not connected to each other. If all of a firm's partners are unconnected to each other, the index takes a value of 1, indicating that none of the firm's contacts are redundant.

For IT-enabled absorptive capacity, since no items exist in the previous literature, we developed items based on the absorptive capacity literature (e.g., Jansen et al. 2005; Lichtenthaler 2009). We will follow Moore and Benbasat (1991)'s procedures to conceptually validate the items for IT-enabled absorptive capacity. The sample items are shown in Table 1.

In order to increase the validity of our model and instrument, interviews will be conducted to analyze whether our theoretical understanding of the influence of structural holes and IT-enabled absorptive capacity on innovation performance reflects managers’ views and whether there is any confusion about the instrument constructed. First, we will use the interviews to ensure that the targeted informants are able to distinguish multiple technologies that support firms’ absorptive capacity. Second, we will examine whether the dimensions forming IT-enabled absorptive capacity that have been identified conceptually constitute the critical tasks of innovation in practice. Third, we will examine the validity of the instrument by asking the interviewees to provide comments on the items.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Sample items</th>
<th>Source</th>
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| IT-enabled Exploration Capability | • My company frequently uses information technologies to scan the environment for new information.  
• My company thoroughly observes market trends with the help of information technology.  
• My company frequently acquires knowledge from external sources with the help of information technology.  
• My company often uses tools to transfer external knowledge to R&D. | Self-developed based on Jansen et al. (2005); and Lichtenthaler (2009) |
| IT-enabled Transformation Capability | • My company uses information technologies to thoroughly maintain relevant knowledge over time.  
• Employees use electronic repositories to store knowledge for future reference.  
• My company is proficient in reactivating existing knowledge for new uses with the help of the internal virtual community.  
• My company uses business intelligence tools to quickly analyze and interpret changing market demands for our products. |                                                    |
| IT-enabled Exploitation Capability | • My company regularly applies new knowledge in new products/services with the help of knowledge visualization tools.  
• My company constantly considers how to better exploit internal knowledge base with the help of knowledge discovery tools.  
• My company easily incorporates internal knowledge into new products with the help of business intelligence tools. |                                                    |

Table 1. Items for IT-enabled Absorptive Capacity

4. POTENTIAL CONTRIBUTIONS

This study is expected to contribute in three major ways. First, this study attempts to address the knowledge gap of how network structure (structural holes) influences innovation and reconcile different views by introducing the concept of IT-enabled absorptive capacity as a moderator. Second, this study attempts to stimulate future research focusing on inter-firm networks and the knowledge sharing through these connections with the help of information technologies rather than viewing them as a black box. By investigating the role of IT-enabled absorptive capacity in moderating the relationship between network structure and innovation, this study attempts to increase our understanding by considering the features of networks nodes and the role of information technologies in innovation. Third, this study integrates concepts from the social network and knowledge management literatures to explain the phenomenon of innovating. It emphasizes the importance of IT-enabled knowledge base and the strategy of leveraging external knowledge for better innovation performance. For future study, we will also collect longitudinal data to test the sequential effects of dimensions of IT-enabled absorptive capacity on innovation.
Reference


