

**The Best Way to Have a Good Idea is to Have a Lot of Ideas: Customer Co-Creation,
Partner Sourcing, and Knowledge Creation for Innovation**

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ABSTRACT

While external knowledge is known to be salient for organizational innovation, we lack understanding of the roles played by different sources of such knowledge, specifically from customers and partners, in influencing innovation. Grounded in the resource dependence and knowledge-based views, we propose a model of capabilities and conditions that enable these two forms of external knowledge acquisition i.e., customer co-creation and partner sourcing, to foster organizations' knowledge creation capability and innovation. We posit that the different forms of external knowledge acquisition contribute differentially towards innovation outcomes. We also propose innovation culture within the organization as a key mediator of the relationship between external knowledge and organizational knowledge creation capability, which then leads to innovation. Finally, we examine the moderating role of knowledge dissemination capability on the relationships between external knowledge of both forms and innovation culture. We test our proposed model using data gathered from 655 organizations in two knowledge intensive sectors i.e., financial and information technology. The model explains 63% of the variance in knowledge creation capability and highlights that organizations with higher capability are more likely to innovate through new patents. We extend prior research on customer co-creation and organizational innovation by identifying intervening organizational variables that explicate the effects of external knowledge on innovation. Organizations may draw implications regarding the capabilities and conditions needed to utilize external knowledge for innovation based on the results.

INTRODUCTION

Innovation is key to sustained competitiveness in current dynamic business environments, serving as a salient way to challenge the commoditization of products and services (Anderson et al. 2008; Anthony and Tripsas 2016; Lyons et al. 2007). Organizations are increasingly relying on external knowledge as a means to overcome innovation barriers, such as declining economies of scale, slow speed to market, and creativity blocks (Baldwin and von Hippel 2011; Bockstedt et al. 2015; Greer and Lei 2012; Lee et al. 2012; Van der Meer 2007; Saldanha et al. forthcoming; Shah and Tripsas 2016). For example, long-established companies like General Electric (GE) realize that innovation through global R&D centers employing thousands of researchers may not be sufficient (Wall 2014). With the rapid change in its business environment, GE has been experimenting with open innovation and leveraging external knowledge e.g., through putting up challenges on GrabCAD.

Yet, even with the increasing use of external knowledge in innovation, there is limited understanding of how various sources of such knowledge contribute differentially towards innovation

outcomes. The literature cited above has primarily explored the role of partner knowledge (Baldwin and von Hippel 2011; Greer and Lei 2012; Lee et al. 2012; Van der Meer 2007), while a separate stream of research has examined how and why users or customers contribute to innovation (Bockstedt et al. 2015; Bogers et al. 2010; Fang 2008; Kankanhalli et al. 2015; Nambisan and Baron 2009; Saldanha et al. forthcoming). Although there has been increased interest in studying the effects of customer co-creation on innovation, its impact relative to other salient forms of external knowledge, specifically partner sourcing, is unclear and understudied (Kristensson et al. 2008; Greer and Lei 2012). While customer co-creation is defined as the direct engagement of a firm's customers in the design and delivery of its goods and services (Fang 2008; Schultze et al. 2007), partner sourcing refers to seeking knowledge from entities such as suppliers, competitors, and universities or research centers (Cassiman and Veugelers 2006; Gray and Meister 2006; Kang and Kang 2009).

The premise of our study is that co-creation with customers is likely to be significantly different from using partner knowledge for innovation for several reasons. First, the nature of the innovation contributions differs in that partners usually provide fewer, specific, and better thought-out ideas (Bridges et al. 2005). For instance, Gattiker et al. (2000) noted that B2B partners tend to take into account situational factors and available product attributes while providing innovation inputs. Customers, on the other hand, tend to provide a large number of ideas that may be less feasible to implement (see also Li et al. 2016; Schulze et al. 2012). Second, partners and customers differ in their motivations for contributing innovation ideas. While partners are usually motivated by their business bottom line, customers are motivated to participate in the co-creation process because they: (1) identify with the products of the organization and want to improve them, (2) enjoy the experience of innovating, (3) want to enhance their reputation, and (4) like to share their experiences with others (Fuller et al. 2008; Kankanhalli et al. 2015). Third, customers usually communicate their innovation ideas through brand communities or through front-line employees of the organization (Di Gangi and Wasko 2009; Shah and Tripsas 2016). In contrast, partners are more likely to share their ideas directly with employees of the organization with whom they have a rapport. These differences have implications for the ways in which the two sources of external

knowledge can be leveraged for organizational innovation and can help address concerns raised by prior research (see Saldanha et al. forthcoming) regarding customer involvement in the innovation process.

Based on the above discussion, our objective is to understand the differential role of customer co-creation versus partner sourcing in enhancing the capabilities and conditions through which an organization can innovate. In other words, even if an organization is convinced about the need for external knowledge in innovation (which itself may not be the case), it would still need to understand how customer knowledge and partner sourcing can be differentially leveraged for enhancing innovation. Using the conceptual framework from Nambisan (2002), we theorize the intervening organizational capabilities and conditions that translate customer inputs and other external knowledge into innovation. Specifically, grounding our work in the resource dependence and knowledge-based views (see Grant and Baden-Fuller 2004), our research investigates how different sources of external knowledge influence organizational knowledge creation capability (KCC) i.e., the ability to identify and amplify new knowledge created by organizational entities e.g., employees, teams, and units (Nonaka and von Krogh 2009). For example, the differences in KCC for customer co-creation versus partner sourcing are likely to arise because customers tend to provide a large number of ideas that may not always be feasible (Li et al. 2016; Poetz and Schreier 2012). This may result in significant additional costs for the organization to process and filter customer ideas, which reduces KCC and resultant innovation.

As part of our theorization, we also identify key intervening conditions and capabilities i.e., innovation culture and knowledge dissemination capability (KDC), that can play a vital role in enhancing organizational KCC and thereby its innovation outcomes. Innovation culture refers to the shared values, norms, and perceptible innovation-oriented practices in an organization that support innovation (Herzog and Leker 2011). Innovation culture is a salient condition to foster the development of an environment that enhances the firm's KCC. Without a supportive culture, employees may be reluctant to take risks and overcome the barriers for accepting external innovation ideas (Chesbrough et al. 2004; Huston and Sakkab 2006). However, the barriers to acceptance might be lower for partner sourcing than for customer

co-creation, as partners usually contribute better thought-out ideas (Bridges et al. 2005). This, in turn, implies that the acceptance of customer ideas would lead to a more supportive innovation culture.

Last, we propose the moderating effect of KDC in creating an innovation culture. KDC, or organizations' ability to share and distribute knowledge to those who need it (Kingston 2012; Vargo et al. 2008), helps to share knowledge within the organization e.g., through knowledge management systems (KMS), and increase the number of available ideas to solve a problem at hand. The need for such a capability is likely to differ for different sources of external knowledge. For example, the need for KDC may be higher for disseminating ideas from customers, as compared to partners, because of the higher volume and diversity of ideas provided. Thus, we seek to achieve the following research objectives:

- 1) Examine the effects of customer co-creation versus partner sourcing on organization's KCC;
- 2) Examine if innovation culture and KCC mediate the relationships between customer co-creation versus partner sourcing on innovation; and
- 3) Examine the differential moderating effects of KDC for the relationships between the two forms of external knowledge acquisition with innovation culture and KCC.

Our research makes the following three contributions. First, our study contributes to the research on organizational innovation by examining how external knowledge acquisition in the form of customer co-creation and partner sourcing influence KCC. Among the limited work at the intersection of the knowledge creation and customer-based innovation literatures, Nambisan (2002) set a broad agenda for researchers to explore the role played by organizational capabilities and conditions in enhancing customers' contributions to innovation. The current research is aimed at answering this question by theoretically and empirically examining how different sources of external knowledge (customer and partners) contribute differentially to KCC and innovation in organizations. Second, our research serves as a step forward by investigating the intervening organizational capabilities and conditions that convert external knowledge into innovations. A rich stream of literature (West and Bogers 2014) has explained that external knowledge can be a valuable resource for organizational innovation. Yet, there is a lack of research outlining the specific capabilities and conditions that may help organizations leverage external

knowledge for innovation. An explication of these intervening variables is relevant for both researchers as well as practitioners. For researchers, our findings provide a more nuanced understanding of the knowledge capabilities and their inter-relationships for innovation in organizations. For practitioners, this allows organizations to develop the capabilities and conditions for leveraging both customer and partner knowledge for innovation. Third, our research highlights the role of specific organizational capabilities facilitated by KMS i.e., KDC, in driving organizational innovation. Prior research (e.g., Cassiman and Veugelers 2006) has suggested that KMS, such as online repositories, forums, and yellow pages, can drive innovation. However, our knowledge about the specific capabilities supported by KMS that are most beneficial for innovation is limited. This research theorizes and empirically examines how KDC, as enabled by a KMS, can help foster an innovation culture in the organization, which in turn would enable organizational innovation.

In the remainder of the paper, we develop a theoretical model and report on our empirical test of the model utilizing survey and patent data of 655 organizations from two highly knowledge-intensive industries (Schricke 2013) i.e., financial and information technology, that can benefit from external knowledge for innovation. Last, the theoretical and practical implications of the research are discussed.

THEORETICAL BACKGROUND

In this section, we make use of the resource dependence and knowledge-based views to highlight the important role played by external knowledge sourcing in organizational knowledge creation and innovation. We conceptualize external knowledge sourcing in terms of partner sourcing (i.e., knowledge from suppliers, competitors, and other partners) and customer co-creation. We then review the relevant literature on knowledge creation and innovation to outline the gap in prior research that our study seeks to address.

Role of External Knowledge

Incorporating external knowledge for organizational innovation has hurdles. Companies have traditionally considered external knowledge as hard to find and risky to rely upon, resulting in the “not invented here” syndrome (Chesbrough et al. 2004). This, and other sources of organizational resistance to

external innovations, can result in innovation inefficiencies (Huston and Sakkab 2006). Thus, organizations would benefit from understanding the capabilities and conditions under which external knowledge could be most effectively leveraged for innovation. Prior research in various disciplines, such as organizational behavior, information systems, and management, has examined organizational knowledge creation, its processes, and its enablers in some depth (e.g., Lee and Choi 2003; Nonaka 1994; Roth 2003). However, the current literature is lacking in terms of understanding how external knowledge - especially the knowledge acquired via customer co-creation and partner sourcing - results in knowledge creation and innovation outcomes for the firm.

Research suggests that external resources that are complementary to a firm's internal resources would help it to innovate (Cassiman and Veugelers 2006). This notion is formalized through the concept of resource dependence (Casciaro and Piskorski 2005), which takes an external perspective to explain firm behavior. This view suggests that organizations need several resources for their survival, only a part of which are available in their internal environment (de Reuver et al. 2011). Due to the scarcity of resources within the firm and to gain critical resources, firms tend to form external networks with suppliers, government agencies, and even with competitors (Kandampully 2002). Specifically, organizations partner with their competitors to share resources such as information, technology, and best practices (Zwilling 2014).

Additionally organizations are engaging in co-creation of products and services with customers and leveraging them as a source of input. Several studies have shown that such external networks are an essential prerequisite for a firm to achieve the capabilities and knowledge required to serve the holistic needs of customers (for a review, see Drees and Heugens 2013). We can, therefore, conclude that the notion of resource dependence promotes the formation of external relationship networks with entities such as customers and partners to gain resources.

The knowledge-based view of the firm, in turn, contends that such specialized knowledge resources drive sustainable competitive advantage (Grant 1996). Accordingly, organizations may engage in knowledge sourcing to gain a variety of ideas for value creation (Cassiman and Veugelers 2006;

Wadhwa and Kotha 2006). Gray and Meister (2006) term knowledge sourcing as the seeking of information from different entities such as suppliers, government agencies, universities, and research agencies (see also, Cassiman and Veugelers 2006; Kang and Kang 2009). Of particular importance to the current research is the notion that customers are a key source of knowledge for the organizations (Afuah and Tucci 2012; Fang 2008; Greer and Lei 2012). This is consistent with prior research, which has established that customers can play an active role in the innovation process (Nambisan 2002; Nambisan and Baron 2010; Shah and Tripsas 2016). Thus, we conceptualize external knowledge sourcing in terms of two constructs in our model i.e., partner sourcing and customer co-creation. Partner sourcing refers to seeking knowledge from entities such as suppliers, competitors, universities or research centers (Cassiman and Veugelers 2006; Gray and Meister 2006; Kang and Kang 2009). Fang (2008) and Schultze et al. (2007) define customer co-creation as the direct engagement of customers in the design and delivery of the goods and services produced by a firm.

Here, we would like to highlight that the concept of customer co-creation includes, but is not limited to the notion of lead user innovation in the innovation literature (von Hippel 2006). Indeed, lead users are a subset of customers, defined as members of a user population who: (1) anticipate obtaining relatively high benefits from obtaining a solution to their needs, and so may innovate; and (2) are at the leading edge of important trends in a marketplace, and so are currently experiencing needs that will later be experienced by many users in that marketplace (von Hippel 2006). Customer co-creation, on the other hand, refers to inputs from any customer (not only lead users) towards the firm's innovation. Customers usually have hedonic, reputational, and altruistic motives for co-creation (Fuller et al. 2008) instead of financial goals, and may not necessarily have the most current knowledge required to solve the organizational problem.

The resource based view suggests that a firm can gain competitive advantage through the application of valuable resources at the firm's disposal (Rumelt 1991; Wernerfelt 1984). Amit and Schoemaker (1993) posit that the encompassing construct previously called "resources" can be divided into resources and capabilities, where capabilities are firm-specific and are used to engage the resources

within the firm, such as implicit processes to transfer knowledge within the firm (Barney 2001; Conner and Prahalad 1996; Tripsas and Gavett 2000). In the current research, we focus on two such knowledge-related capabilities of the organization i.e., KCC and KDC, which could assist in the conversion of external knowledge resources for innovation. Consistent with Kingston (2012), KDC is defined as the organization's ability to share and distribute knowledge to those who need it (see also, Vargo et al. 2008). KCC refers to the ability of the organization to identify and amplify new knowledge created by its entities such as employees, teams, and units (Nonaka and von Krogh 2009).

Knowledge Creation and Innovation

In this research, we consider customer co-creation, partner sourcing, and innovation in the light of the resourced-based and knowledge-based views of the firm. As per the resource-based view, to attain sustainable competitive advantage, organizations need to be engaged in a continuous innovation state by acquiring resources that are valuable and rare (Barney 2001; Peteraf 1993). The resourced-based view considers the organization as bundle of firm-specific resources and capabilities upon which innovation and competitive advantage are based. The knowledge-based view distinguishes knowledge as the most valuable resource of an organization (Spender and Grant 1996) and suggests that innovation can be achieved by acquiring new knowledge. In conjunction with the shift to a knowledge-based economy (e.g., digitalization, internetworking, virtualization, the role of online networks and services), the knowledge-based view has gained importance for explaining organizational innovation (Bogers et al. 2010).

Prior research in several disciplines, including management and IS, has examined organizational knowledge creation, defined as the identification and amplification of new knowledge by organizational entities (Nonaka and von Krogh 2009). Following the classic work by Nonaka (1994), subsequent research has explored various enablers of knowledge creation in organizations. For example, Lee and Choi (2003) examined the effects of organizational structure, culture, people, and technology elements on knowledge creation. Based on their empirical study, they found that centralization, collaboration, trust, and IT support contribute towards organizational knowledge creation. While Malhotra et al. (2005) explained how collaboration with supply chain partners can create knowledge for the organization,

several other studies (e.g., Roth 2003) have explicated the role of individuals e.g., knowledge facilitators, in enabling knowledge creation. However, we observed a lack of research, as also indicated in recent work (e.g., Begona Lloria and Peris-Ortiz 2014), that links external knowledge, including customer inputs, to knowledge creation in organizations.

At the same time, there has been a body of research (see Bogers et al. 2010) on how (e.g., Schultze et al. 2007) and why (e.g., Nambisan and Baron 2009) external knowledge sources contribute to a firm's innovation. These studies have mainly considered absorptive capacity as the key characteristic of an organization that allows it to assimilate external knowledge for innovation (e.g., Escribano et al. 2009; Fosfuri and Tribo 2008). However, findings of such studies may not provide the whole picture since absorptive capacity is a complex construct that addresses how knowledge is "received" and integrated into the firm. This construct relates to various capabilities that allow a firm to integrate knowledge (Matusik and Heeley 2005). Other studies such as Caloghirou et al. (2004) considered external knowledge as a whole and related its exploitation for innovation to the firm's R&D intensity and R&D collaborations with other organizations. However, work by Caloghirou et al. and other similar studies (e.g., Cassiman and Veugelers 2006) mainly tried to explore if and how internal and external sources of knowledge complement each other, rather than examine the effects of different forms of external knowledge acquisition as we aim to do.

Among the literature that examined the role of specific forms of external knowledge in innovation, some studies focused on one particular type or source of external knowledge. For example, Hsueh et al. (2010) observed that firms with stronger business partner networks achieved better innovation performance, without testing the mechanisms of how this happens. In terms of partner sources, while Eisingerich et al. (2009) tested the impacts of relationship commitment and diversity with partners on firms' service innovation focus, Fang (2008) examined the innovation impact of customer co-creation in B2B dyads. Yet, other studies (e.g., Kankanhalli et al. 2015) investigated how online tools or platforms enable users or consumers to participate in software innovation. Our review showed that limited studies have compared the effectiveness of different forms of external knowledge acquisition for innovation.

Among the few studies, Vega-Jurado et al. (2009) compared two strategies (buying vs. cooperating) and two types of sources (industrial vs. scientific agents) in terms of their effects on innovation, while Kang and Kang (2009) compared the effects of three ways of external knowledge sourcing (information transfer from informal networks, R&D collaboration, and technology acquisition) on technology innovation.

Thus, while the importance of customer involvement and partner sourcing for innovation is acknowledged, there is a lack of research comparing the effects of these two forms of external knowledge on innovation. Moreover, there is a need to understand the intervening capabilities and conditions through which customer co-creation and partner sourcing influence firm innovation.

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

The goal of this study is to understand the capabilities and conditions that differentially enable customer co-creation and partner sourcing to create knowledge and foster innovation for the organization. We propose that the ideas produced via customer co-creation and partner sourcing are likely to increase KCC, which, in turn, is expected to result in greater innovation in terms of the number of patents granted for the organization. While we propose that customer co-creation and partner sourcing directly influence KCC, we also posit that they promote an innovative organizational culture by signaling that ideas from diverse sources are important to the organization. Therefore, we propose that a secondary mechanism for the positive effect of customer co-creation and partner sourcing on KCC occurs through the partial mediation of innovation culture. Finally, we posit that the creation of an innovative culture and KCC can be strengthened further by effective KDC. That is, the effects of customer co-creation and partner sourcing on innovation culture and KCC would be enhanced by KDC. Figure 1 presents our research model.

-- Insert Figure 1 --

External Knowledge

With the advent of new IT, organizations are moving beyond traditional sources of knowledge for innovation (Chen et al. 2012; Gray and Meister 2006; Lee et al. 2014). Even the largest R&D, active

organizations do not rely solely on internal sourcing (Cassiman and Veugelers 2006; Chang and Gurbaxani 2012). Organizations gather knowledge from a variety of additional sources such as suppliers, competitors, government agencies, universities, research centers, and social media (Yam et al. 2011). Indeed, novel and heterogeneous knowledge has been found beneficial for creativity and innovation (Burt 2004; Hargadon and Sutton 1997). Rodan and Galunic (2004) reported that the variety of knowledge to which managers are exposed positively affects not only their overall performance, but also their ability to accomplish complex tasks and to create and implement novel ideas. Recent empirical work has also reported on the extent to which knowledge heterogeneity is related to innovation (Corsaro et al. 2012). Therefore, we posit that the greater the ability of the organization to acquire external knowledge about partners, competitors, suppliers, government regulations and new products and services, the more its capability to create new knowledge for business problems.

H1: Partner sourcing is positively related to KCC.

We posit customer co-creation as a second external source of KCC. Present day customers demand a much greater role in customizing the world that surrounds them. They not only provide feedback and input on their experiences, they also actively participate in online communities to provide input towards products and services that better suit their needs (Di Gangi and Wasko 2009). Bendapudi and Leone (2003) define a situation where the customers and employees of the organization interact to develop or improve products, services, or processes as customer co-creation. Through co-creation initiatives, organizations can potentially gain access to a large number of new and fresh ideas that they can then leverage to address their business problems more effectively and efficiently (Li et al. 2016).

Knowledge creation involves novel rearrangements of ideas, methods, processes, and strategies, among others (Burt 2004; Fleming et al. 2007). When organizations involve customers as co-creators, employees and customers are able to challenge traditional problem solving perspectives and discover linkages that have not been discovered before (Fang 2008). Acting as partial employees, these customers can either influence parts of the problem-solving process or do these parts themselves (von Hippel 2006).

Customers, in such a situation, may serve as valuable participants and can help in creating new combinations of knowledge, thereby enhancing the KCC of the organization.

H2: Customer co-creation is positively related to KCC.

The key premise of our work is that co-creation with customers is likely to be significantly different from partner sourcing in its effect on innovation. We argue that there are two key differences between customers and partners that would have a bearing on their influence on KCC. First, partners tend to provide fewer and better thought-out ideas. Customers, on the other hand, are likely to provide a large number of ideas that may not be well thought-out, as they generally lack business specific knowledge (Li et al. 2016; Schulze et al. 2012). Customer co-creation would, therefore, require more organizational resources to filter customer ideas and determine their feasibility, which would have a bearing on the KCC of the organization. Along these lines, Di Gangi and Wasko (2009) illustrated that the idea complexity has a direct bearing on the idea's implementation. Literature on information overload and cognitive overload (e.g., Bawden and Robinson 2009) also suggests that when people receive too many messages, they are often unable to recognize the significance of the incoming messages. Collectively, this suggests that such a resource intensive process may result in a slower conversion of customer ideas into KCC than the conversion of partner ideas into KCC.

Second, partners are usually motivated by profits whereas customers typically co-create with firms because of non-monetary reasons (Culnan et al. 2010; Shah and Tripsas 2016). Specifically, because partners would like to improve their bottom-line, they tend to delve into the business processes that particularly address their current task requirement and present their ideas in a succinct and precise manner (Li et al. 2016). Customers, however, are motivated to co-create because they: (1) identify with the products of the organization and want to improve them, (2) enjoy the experience of innovating, (3) want to enhance their reputation, and (4) like to share their experiences with others (Fuller et al. 2008). Therefore, while customers contribute in developing KCC, the effect is likely to be weaker than for partner sourcing, where business profits may provide a stronger motive.

H3: Effect of partner sourcing is stronger than the effect of customer co-creation on KCC.

Role of Innovation Culture

Prior research has suggested culture to be a key determinant of the success of knowledge management efforts (Davenport et al 1998) and in particular knowledge creation (Lee and Choi 2003). However, it is an often neglected variable in practice. The innovation literature echoes the necessity of a pro-innovation culture to promote the creation of new products and services (Lyons et al. 2007). In this research, we examine innovation culture as a condition that we believe is critical to developing KCC and organizational innovation.

Indeed, just having creative employees may not be enough to foster KCC and innovation (Cassiman and Veugelers 2006). Rather, it may require a climate that is conducive for fresh ideas to gain attention. We argue here that a culture of innovation provides such an environment. By sourcing external knowledge about a variety of aspects, and by accepting customer ideas about products, processes, and services into consideration, the organization signals that diverse ideas are important regardless of their origin. Such a signal would undoubtedly create a culture where innovation is encouraged and valued. Organizations create and sustain such a culture in a variety of ways. For example, BMW invests regularly in their customer co-creation labs. In 2010, more than a 1000 users shared their ideas on how BMW can better develop their telematics and driver assistance systems. Subsequently, BMW collaborated with a selected group of users and introduced two of these ideas into the market (Hagel and Brown 2015). Now, the same lab is running another contest to improve the luggage compartment of BMW automobiles. Such initiatives not only generate new ideas for the organization, but they also indicate the support of the senior management towards fostering an innovation culture in the organization. These initiatives focus employee attention, which then drives their commitment and behavior towards creating knowledge.

The input of external sources of knowledge, including from customers, can lead to KCC and benefit the organization if it is ready to accept these new ideas (Gold et al. 2001). This readiness would require a culture of innovation where the organization values the importance of external ideas, and employees are willing to act on them. Kaplan (2013) provides several examples, e.g., Facebook, OpenTable, and Proctor & Gamble, where organizations have transformed themselves to foster such a

culture driven by external sources. He notes that it was, in part, because of their culture of leveraging external sources of knowledge that Proctor & Gamble was able to develop revolutionary products like Tide Pods and Mr. Clean Magic Erasers when they increased their externally driven innovations from 10% to 50%. Therefore, we posit:

H4: The relationship of partner sourcing with KCC is partially mediated by innovation culture.

H5: The relationship of customer co-creation with KCC is partially mediated by innovation culture.

Innovation culture is defined here as shared values, norms, and perceptible innovation-oriented practices in the organization that support innovation (Herzog and Leker 2011). Innovation culture serves as a salient condition to foster the development of an environment that enhances the firm's KCC. Without a supportive culture, employees are reluctant to take risks and overcome the barriers for accepting external innovation ideas (Chesbrough et al. 2004; Huston and Sakkab 2006). However, the barriers to acceptance might be lower for partner sourcing than for customer co-creation, as partners usually contribute better thought-out ideas (Bridges et al. 2005). Thus, the acceptance of customer ideas implies a more supportive innovation culture. Hence, we hypothesize:

H6: Effect of customer co-creation is stronger than effect of partner sourcing on innovation culture.

Moderating Impact of KDC

We suggest that the positive influence of customer co-creation and partner sourcing on innovation culture would be stronger for organizations that have the ability to disseminate knowledge more effectively. Organizations can do so via a variety of information technologies, such as KMS, that allow for identifying, capturing, and leveraging knowledge in an organization (Joshi et al 2010; Alavi and Leidner 2001). Evidence from prior literature suggests that knowledge sharing and dissemination capabilities are crucial organizational conditions for successful knowledge management and exploitation (Chiu et al. 2006). Caloghirou et al. (2004), for example, contend that KDC is essential for leveraging external knowledge within the organization. Here, we posit that KDC enhances the effect of customer and partner co-creation on innovation culture and KCC.

Above, we argued that by drawing in external knowledge from customers and partners, an

organization signals openness to new ideas, which facilitates an innovative culture. However, unless the external knowledge is disseminated within the organization, this signal will not be received by the employees. Organizations that are hierarchical and agency-based are likely to have tighter controls, whereby the outside-in knowledge is provided on a need to know basis (e.g., Chesbrough 2011; Laursen and Salter 2006). This, regardless of the existence of new knowledge within the organization, clearly signals that employees are to work within the boundaries of the existing structure and processes. Such conditions are not likely to create a culture of innovation. By contrast, an organization that has structures and processes that support wide dissemination of such knowledge, will signal openness and ultimately create shared norms that support creative thinking (Herzog and Leker 2011). Further, by disseminating knowledge, an organization sends the signal that experimentation with the new knowledge is allowed and encouraged (Dodgson et al. 2006). This will empower employees to generate novel recombinations, consistent with a culture of innovation.

Second, while collaborating with customers in co-creation initiatives or while sourcing knowledge from partners, organizations may generate a large number of ideas. Many of these ideas may not be relevant to the problem or may not adequately solve the problem the organization is trying to resolve. These additional ideas, however, might spillover as disseminated knowledge to other sections of the organization and help address a different problem in a different domain. Gray et al. (2011), for example, note that several key innovations are a result of simple fortuitous interactions among individuals within and outside the organization who were unaware that their ideas had mutual relevance. The key condition for such fortuitous interactions is the ability of employees in the organization to communicate with each other and retrieve pertinent business knowledge. Following the same line of thought, we argue that when knowledge from customer co-creation or partner sourcing is readily disseminated by the organization, this can help create a culture of innovation.

In summary, partner and customer co-created knowledge coming into the organization signal that ideas from diverse sources are important to the organization, but only if organizational workers are made aware of these new ideas. Therefore, knowledge dissemination capability is critical for the creation of an

innovation culture which lets employees know that innovation is an organization-wide endeavor rather than being confined to a specific teams or individuals. Therefore, we posit that KDC strengthens the relationship between both forms of external knowledge and innovation culture.

H7: KDC strengthens the positive relationship between customer co-creation and innovation culture i.e., the relationship is stronger when KDC is high than when it is low.

H8: KDC strengthens the positive relationship between partner sourcing and innovation culture i.e., the relationship is stronger when KDC is high than when it is low.

A culture of innovation would require the organization to allow experimentation, accept diverse ideas, learn from failures, and in some cases accept employee slack (Davenport et al 1998). Willingness to try new ideas and find a suitable idea for the problem at hand is likely to be higher if there are more available options to choose from. As we have argued above, the number of ideas offered by partners tends to be limited compared to the number of ideas offered by customers (Li et al. 2016; Poetz and Schreier 2012). The larger the number of ideas, the greater is the need for technology e.g., a KMS, which would allow these ideas to be stored and effectively disseminated within the organization. Moreover, partners are more likely to share their ideas directly with employees in the organization with whom they have a rapport. Customers, on the other hand, are more likely to share their ideas with front-line employees or through websites. Thus, organizations are likely to derive a stronger value from these customer ideas if more employees are able to access them. KDC, to the extent available, would facilitate such a dissemination of ideas. Therefore, KDC is expected to be more effective for customer co-creation than for partner sourcing.

H9: The moderating effect of KDC will be stronger for the customer co-creation and innovation culture relationship than for the partner sourcing and innovation culture relationship

The positive influence of external knowledge from customers and partners on KCC may depend to a large extent on how accessible this external knowledge is to various entities within the organization. Therefore, when the external knowledge is disseminated broadly within the organization, this external knowledge is more likely to translate into KCC. Built-in processes that facilitate dissemination of knowledge are important for bringing the new knowledge closer to individuals who are involved in the

relevant processes so that they are able to engage in experimentation and entrepreneurial risk taking (Herzog and Leker 2011). Easy access to new cutting-edge knowledge allows for novel combination and recombination of knowledge elements derived from connecting people, firms, and resources (Obstfeld 2005). When knowledge is disseminated across functional areas, as well as individuals and groups with diverse frames of reference, it creates an environment that carries a potential for novel recombination. Thus, KDC allows diverse external knowledge to more effectively enhance KCC. Relatedly, dissemination of knowledge is also essential for transactive memory (Lewis et al. 2005) to develop within the organization, where the awareness of “who knows what” is high and employees do not feel the need to “hide” knowledge. Transactive memory allows open pathways of communication that are essential for enhancing KCC. Therefore, we suggest that KDC strengthens the relationship between external knowledge from partner sourcing or customer co-creation and KCC.

H10: KDC strengthens the positive relationship between customer co-creation and KCC, i.e., the relationship is stronger when KDC is high than when it is low

H11: KDC strengthens the positive relationship between partner sourcing and KCC, i.e., the relationship is stronger when KDC is high than when it is low.

Organizational Innovation

An established stream of research has examined a variety of determinants of knowledge creation, such as leadership, resource availability, and organizational cohesiveness (see Nambisan 2002). More recently, researchers (e.g., Lyons et al. 2007) have started exploring other conditions or norms such as innovation culture that may be relevant to sustaining KCC. The key argument for innovation culture fostering KCC is that organizations promoting an innovation culture encourage their employees to be open to and accepting of new ideas. Such a focus then drives employee motivation, behavior, and commitment towards finding new solutions to business problems, thereby enhancing KCC. Thus, we posit,

H12: Innovation culture is positively related to KCC

Innovation is defined as the creation of new products and services not previously available to the

firm's customers, including an addition to the current offerings or a change in existing offerings (Menor and Roth 2008). It includes changes in products, services, processes and business models that could cater to new or existing markets. Organizational employees can use their tacit and explicit knowledge in a variety of ways for organizational problem solving. A high KCC indicates that they may combine new knowledge with their existing knowledge structures to either develop new or transform existing products, processes, or services resulting in innovation. Indeed, such recombination of diverse knowledge is seen as a wellspring of innovation (Rodan and Galunic 2004). Furthermore, the higher the KCC, the greater is the choice set of knowledge accessible to employees to innovate. Therefore, we argue that KCC generates more unique ideas that could be translated into innovations e.g., in terms of patents granted for the organization.

H13: KCC is positively related to organizational innovation

RESEARCH METHOD

In this section, we discuss the organizational settings, participants, and procedures for our empirical work, followed by the details of our measures.

Organizational Setting, Participants, and Data Collection Procedure

The setting for testing the research model presented in Figure 1 was a sample of organizations based in the United States (U.S.) and in Singapore. The U.S. and Singapore offer similarities and differences that are useful for our study purpose. While both countries have developed economies that rank highly on innovation indices¹, there are considerable differences in the size and composition of the two economies. In terms of innovation parameters, the Bloomberg Innovation Index in 2015², ranked Singapore highly on manufacturing innovation and research personnel, while the U.S. ranked highly in terms of its high-tech companies and patents. Thus, including firms from these two economies that are similarly innovative but have different strengths and weaknesses in terms of innovation inputs and

¹ The U.S. and Singapore ranked 5th and 7th on the Global Innovation Index in 2015.
<http://www.globoinnovationindex.com/en/2015-into-top-10-page-04-15>

outcomes provides richness to our data. The organizations in our sample provide IT services and financial services to their customers. The IT and financial industries were chosen since both are highly knowledge intensive (Schricke 2013) and contribute significantly to the economies of the US and Singapore. Financial services is one of the largest sectors in the Singapore economy³, while the US leads the world in the IT services sector⁴. In total, 655 organizations participated in the study; 399 organizations from the U.S. and 256 from Singapore.

For the organizations in the Singapore, we generated lists of companies in the IT and financial sectors. We used two sources to create our list of IT companies, i.e., Findouter Singapore and Singapore Companies Directory, and used the Monetary Authority of Singapore for our list of financial institutions. All the IT and finance companies listed in these two sources were included. We then emailed the corporate communications contact in each of these organizations to seek participation in our study. If the organization agreed to participate, we asked them to nominate a suitable person (person familiar with the innovation initiatives and patent applications for the organizations) to answer our survey questions. All organizations were given a month to respond to our survey. In between, the non-respondents were contacted via phone to remind them to complete the survey. In all, the entire data collection process lasted about two months. We contacted a total of 615 organizations in Singapore (506 IT and 109 financial companies). Overall, 256 companies provided complete survey responses (207 IT and 49 financial companies) resulting in a response rate of 41.62%.

For the data collection in the U.S., we contracted with a market research company and obtained a one-time use mailing list of IT and finance sector project managers. This list was filtered by the market research company for managers engaged in the company's knowledge creation and innovation initiatives. We then contacted these employees via email to solicit their participation in the study. A total of 502 organizations were contracted. We received a total of 399 usable responses after eliminating observations

³ <http://www.singstat.gov.sg/statistics/visualising-data/charts/share-of-gdp-by-industry>

⁴ <https://www.selectusa.gov/software-and-information-technology-services-industry-united-states>

with missing data (224 IT and 175 financial companies). The descriptive statistics of the combined dataset is provided in Table A1 in the Appendix.

Measurement

All constructs in this study were measured based on items validated in prior research. The items for partner sourcing and KDC were adapted from Pee and Kankanhalli (2009) and Gold et al. (2001); customer co-creation from Auh et al. (2007), Dobni (2008), and Menor and Roth (2008); innovation culture from Bose (2004) and Hu et al. (2009); and KCC from de Pablos (2002) and Gold et al. (2001). The final dependent variable, innovation, was operationalized by measuring the number of successful new patents registered by the organization in the one year period prior to the data collection. Seven-point Likert agreement scales were used to measure the remaining items, except innovation. Innovation was measured as a categorical variable (measured as High or Low, where High: greater than 10, and Low: less than or equal to 10). We selected 10 as the cutoff because 10 was the median number of patents granted for the organizations in our sample. In addition to self-reported number of patents, we collected patent application date data for these organizations from the World Intellectual Property Organization (WIPO) – as our organizations were based in different countries i.e., US and Singapore. Similar to the self-report data, we classified the organizations as high innovators (more than 10 successful patents) versus low innovators (less than 10 successful patents) using the WIPO data. The correlation between the innovation variable operationalized by the two different data sources (self-report and WIPO) was very high (0.91). Therefore, we used the self-reported data to conduct our analysis. The items constituting the survey are presented in Table 1.

-- Insert Table 1 --

We controlled for a number of variables in our study. Deeds and Decarolis (1999) recommend caution when using patents. First, larger organizations are expected to file for more patents than smaller organizations. Second, organizations with higher R&D budgets are likely to file for more patents than organizations with smaller R&D budgets. Therefore, we controlled for the size of the organization, R&D and IT investments operationalized by the number of employees, number of employees for R&D

initiatives, as well as the dollar amount for R&D, and dollar amount allocated for IT investments respectively. Because we had organizations from different industries and from different countries (i.e., the United States and Singapore), we introduced dummy variables to control for country specific or industry specific effects. Finally, we controlled for the slack time the organization provides to its employees, as well as the management support for innovation

DATA ANALYSIS AND RESULTS

As part of our preliminary analysis, we screened our data for any outliers, which did not result in cases being excluded. We conducted pooled sample tests to determine if it was appropriate to pool the data from the organizations in the U.S. and Singapore, and did not find any concerns. We then tested our data for reliability, convergent, and divergent validity. The Cronbach alpha coefficients for all our constructs exceeded 0.80, with the lowest being 0.81 for partner sourcing and highest being 0.95 for KCC, thus showing adequate reliability (Hair et al. 2006). A principal component analysis with varimax rotation of the independent variables indicated a strong support for convergent validity. Although we do not present the factor analysis results here due to lack of space, all loadings were greater than 0.70 and all cross-loadings were less than 0.30. Further, we found that the means of all scales were close to or above 4 and the standard deviations were above 1 (except for innovation which is a categorical variable). The average variance extracted for all variables was higher than the squared correlations between that variable and any other variable. Table 2 shows the relevant descriptive statistics and correlations. Table 2 indicates that the largest squared correlation between any two variables was 0.52 (KCC and KDC) while the smallest AVE was 0.68 (KCC). We also examined the VIF values for the presence of multicollinearity. All VIF values were under 4, indicating our data did not suffer from multicollinearity issues (Hair et al. 2006).

-- Insert Table 2 --

Model Testing

We used partial least squares (PLS) analysis to test hypotheses H1- H12 and logistic regression

for testing H13. We did this for two reasons. Using PLS, we were not only able to account for the effect of different determinants of KCC concurrently, but also model the interaction effects of KDC. Because our final dependent variable (i.e., innovation) was a categorical variable, we used a binary logistic regression to test for H13. Using the Smart-PLS software, we tested two different models. For our baseline model, we only examined the direct effects of partner sourcing, customer co-creation, and innovation culture on KCC. We then examined the moderated effects model. Cohen's f-square test showed that the moderated effects model performed significantly better than the baseline model. Figure 2 presents the results of the moderated effects model. The results show that the model explained a significant amount of the variance in KCC ($R^2 = 0.63$). Further, none of the control variables was significant. Moreover, the dummy variable introduced to account for country level effects was also not significant.

-- Insert Figure 2 --

Based on the results presented in Figure 2, we found support for 10 out of 13 hypotheses, i.e., H1-H6, H7, H9, H12, and H13. Support for H1 and H2 indicates the direct influence of customer co-creation and partner sourcing on KCC over and above their influence via innovation culture. Interestingly, we found that partner sourcing has a stronger influence on KCC than customer co-creation (as per H3). Comparing the coefficients of partner sourcing (0.35, $p < 0.001$) and customer co-creation (0.06, $p < 0.01$) on KCC indicates that the difference is significant ($p < 0.001$). Support for H4 and H5 indicates that actively involving customers in solving business problems and getting knowledge on partners tends to foster a culture of innovation in organizations. A comparison of the coefficients of partner sourcing (0.24, $p < 0.001$) and customer co-creation (0.27, $p < 0.001$) on innovation culture shows that the difference is significant ($p < 0.001$), thus providing support for H6. Further, innovation culture will increase KCC as is shown by the significant support for H12 (0.22, $p < 0.001$).

H7, H8, H10, and H11 hypothesize the moderating effect of KDC on the relationships between the two forms of external knowledge and innovation culture or KCC. Of these, our results only supported H7 suggesting that the influence of customer co-creation on innovation culture is greater for organizations

that can readily disseminate knowledge. The interaction plot depicting H7 is presented in Figure 3. Additionally, our results show that the moderating influence of KDC is stronger ($p < 0.001$) for customer co-creation (0.12, $p < 0.001$) than for partner sourcing (0.04, n.s.) showing support for H9.

-- Insert Figure 3 --

As we classify the organizations that participated in the study as high (coded as 1) versus low (coded as 0) innovators based on their number of patents, we used binary logistic regression to examine the relationship between KCC and innovation. Based on the results of the logistic regression, we found that the odds of successfully filing a high level of patents are 1.39 (calculated using $e^{0.33}$) times higher for organizations creating more knowledge than for organizations not creating enough knowledge. Thus, H13 was supported.

Post-Hoc Analysis

Contrary to our expectations, we did not find support for H8, H10, and H11 indicating that: (1) KDC does not influence the relationship between partner sourcing/customer co-creation on KCC, and (2) KDC does not influence the relationship between partner sourcing and innovation culture. To better understand these findings, we divided our dataset into groups - one representing IT organizations and the other representing financial organizations. The resulting IT organization dataset had 431 observations and financial organization dataset had 234 observations. Testing the research model of Figure 1 on these two groups separately reveal two interesting observations (see Table 3).

-- Insert Table 3 --

First, the main effects of customer co-creation and partner sourcing on KCC and innovation culture remained largely consistent across the IT, financial, and combined datasets. However, we found that: 1) the influence of customer co-creation on KCC was fully mediated by innovation culture for IT companies, and 2) partner sourcing has stronger influence on KCC for financial companies than IT companies. This indicates that creating a strong innovation culture is more vital for IT organizations than financial organizations if they want to enhance their KCC. This observation could be attributed to the more cut-throat competition and lower cost of entry for IT organizations (see Hawkins 2013).

Second, and more interestingly, we found that the moderating effect of KDC was more pronounced for IT organizations than for financial organizations. More specifically, for IT organizations, KDC moderated the effects of customer co-creation on innovation culture as well as KCC. KDC also moderated the effect of partner sourcing on innovation culture for IT organizations. For financial organizations, the moderating influence of KDC was similar to the combined dataset such that KDC only moderated the relationship between customer co-creation and innovation culture. This could be because financial organizations are a lot more regulated (Cappgemini 2013) than IT organizations. Therefore, legal requirements might hinder knowledge sharing and KDC. Another possible explanation for this interesting observation could be the value of information asymmetry. Finance organizations usually value information asymmetry much more than the IT organizations, which would be reduced by KDC. Therefore, financial organizations are less likely to value KDC than IT organizations.

DISCUSSION

Internet-based communication technologies have greatly reduced the distance between organizations and their partners. These technologies have also brought customers closer to sellers and/or organizations (Nan 2011). These closer and instant interactions create opportunities for researchers to revisit how organizations can work with their customers to generate and test ideas for new products, services, and solve complex business problems. Our study contributes to innovation research by examining the role of knowledge-related antecedents in attaining greater innovation outcomes. We investigated the role of customer co-creation and partner sourcing, in enhancing KCC. We found that different forms of external knowledge—customer co-creation and partner sourcing—contribute differentially towards KCC. We found innovation culture to be a key mediator of the relationship between external knowledge and KCC and were able to demonstrate the moderating role of KDC. The results explained 63% of the variance in KCC. Our findings highlight that organizations creating new knowledge are more likely to innovate through patents.

Theoretical Contributions

Our study offers several important theoretical contributions. First, our research contributes to the

research on organizational innovation by parsing out how customer co-creation and partner sourcing enhance KCC. Prior research (e.g., Van der Aa and Elfring 2002; Yli-Renko et al. 2001) has examined the role of external knowledge in creating organizational innovation. However, very little work has delineated the role of customers from other sources of knowledge. Unlike traditional customers, modern day customers demand a greater role in customizing the world that surrounds them. Such customers are willing to go beyond just presenting feedback to actively participate in solving business problems. Yet, the number and the quality of customer ideas may differ from those of the partners because of the underlying motivations and core business knowledge. The results of our study shows that while these customer efforts are fruitful in enhancing KCC, partner sourcing has a much stronger direct influence on KCC. To the best of our knowledge, this study is the first attempt to delineate this complex relationship between different sources of external knowledge and organizational innovation initiatives.

Second, our research contributes to the innovation and knowledge management literatures by identifying intervening organizational capabilities and conditions that help knowledge creation in organizations. Identifying such capabilities and conditions has the potential to provide a more nuanced understanding of KCC, a key enabler of innovation. In doing so, we uncover the role of innovation culture in mediating the relationship between customer co-creation / partner sourcing and KCC. Based on our findings, we contend that collaborating with customers and sourcing knowledge from a variety of partners (e.g., competitors and suppliers) would drive organizations to change their norms of innovation. For instance, employees who work closely with customers will value exploring novel ideas when solving business problems. Similarly, employees paying close attention to the knowledge inputs from suppliers, research and development agencies, competitors, and government agencies would seek out changes and try to innovate to stay current.

Third, our research explores the moderating and amplifying role of KDC in innovation. Organizations are increasingly investing in technologies such as KMS as they see such systems as important drivers of firm performance (Wang et al. 2013). However, our understanding of specific organizational processes that allow organizations to leverage the benefits of such systems and translate

these benefits into firm performance is fairly limited (Newell 2015; Yoo et al. 2010). Our research theorizes and empirically examines the role of one organizational process i.e., knowledge dissemination, that typically uses a KMS as its enabler. Highlighting the moderating role of knowledge dissemination capability, we argue that organizations' ability to disseminate knowledge to their employees using IS (e.g., a KMS) will result in a more innovative culture, greater KCC and innovation.

Finally, our research sheds light on sector specific intricacies. While both IT and finance sector are known to be knowledge intensive (Schricke 2013), the results of our study showed differences across the two sectors. Some of these differences can be attributed to the lower cost of entry and the cut-throat competition in the IT sector as compared to the finance sector, while others can be attributed to the high regulation in the finance sector. Our study serves as an important data point in recognizing these differences and encourages researchers to develop more sector specific theories that would help better explain the nuances of the organizational innovation phenomenon.

Practical Implications

Our study provides four key practical implications. First, our research evidences the benefits of involving customers in developing new innovations. Per the recommendations of the marketing literature, managers usually develop new products in-house and then conduct extensive testing with their customers. For this purpose, managers closely listen to the feedback provided by customers and revise their products to better meet customer needs. Although such feedback from customers is very valuable, our research goes further and recommends managers to partner with the customers using communication and collaboration technologies available to them. Such partnerships would promote customers (not just lead users) co-developing products and services with the employees of the organizations. To facilitate such co-creation, we recommend managers put in place business processes that would allow integration of customers' inputs in the product / service development lifecycle. These business processes should be enabled by advanced communication and collaboration technologies that would make customer and employee co-production as effortless as possible.

Second, our research recommends managers to make knowledge from different sources and from

customer co-creation readily available to their employees. Managers should consider investing in technologies (e.g., a KMS) facilitating such knowledge dissemination. This is important for two reasons. First, knowledge or ideas generated in one context may be applicable in another context. Such knowledge if compiled well and made available to the employees of the organization may be a source of unexpected knowledge. Second, an employee may need an idea to be explained in several different ways before he/she can develop a mental model and internalize it. Organizations often lack resources that would allow them to have multiple explanations of a single idea. However, with customer co-creation and sourcing knowledge from multiple partners, organizations may be able to compile multiple explanations in one single area and make it available to employees. Discovery of unexpected knowledge or multiple explanations of one idea may persuade employees to think about novel solutions to mundane problems that they experience on a daily basis.

Third, many organizations assess their employees' involvement in knowledge creation activities by the number of patents they file. Some companies (e.g., Google) even provide employees with additional compensation as a reward for each successful patent filed. Therefore, most managers involved in the new product development or innovation departments are looking to develop knowledge that can be patented. Our research serves as an additional data point highlighting how managers can effectively create such opportunities for themselves and their employees.

Finally, IT managers are often criticized for lack of significant returns on IT investments. Our research results can help make a case for the IT investments. Based on the findings of our study, we suggest that investing in KMS technologies to enhance the influence of customer co-creation and partner sourcing can increase an organization's innovation outcomes. Therefore, managers could potentially use the number of new successful patents from customer co-creation initiatives as a measure of return for any investments in knowledge management or collaboration tools.

Limitations and Future Research Directions

As with other research studies, our research is not without limitations. Even though the central goal of our research was to examine knowledge creation, we wanted to link knowledge creation to a key

organizational outcome, i.e., innovation. We operationalized our innovation construct as the number of patents the organization has obtained (high vs. low). Prior research, however, has shown that there are several other ways to measure innovation. For example, Kumar et al. (2011) used sales and profitability, while Pavlou and El Sawy (2006) used process efficiency and product effectiveness. We focused on patents because: (1) we wanted to examine innovation, and patents indicate development of *new* ideas; and (2) the goal of our research was to explicate innovative knowledge creation resulting in *unique* solutions to business problems. Future research could test for the generalizability of our research model by incorporating other operationalizations of innovation.

The goal of our research was to examine the influences of customer co-creation and partner sourcing on knowledge creation and subsequent innovation. Media synchronicity theory (Dennis et al. 2008) argues that the type of medium used is likely to have an influence on communication performance. Future research could examine the role of different types of media in facilitating customer collaborations. Using a rich medium that allows customers to virtually co-create is likely to invoke higher participation as it increases engagement. Researchers could also manipulate communication media to determine if different technologies would change hedonic attributes of customer co-creation. Working with cutting edge technologies might present additional motivation for customers to participate in the co-creation process. Finally, future research could examine if the interaction between customer co-creation and task would produce some friction in the development process. For example, if the customer co-creation task is complex such that it is difficult to break it down into subtasks, it might create friction between employees who are being paid for the job and customers who are volunteering their time for co-creation.

CONCLUSIONS

Organizations invest in a variety of technologies to promote knowledge creation and innovation. While a number of these technologies allow for sourcing knowledge from a variety of sources such as suppliers, government agencies, and R&D firms, others allow for organizations to work closely with their customers in the problem solving process. However, our understanding of how and if these

investments differentially result in knowledge creation and innovation is limited. Our research sought to investigate and understand the role of knowledge-related antecedents of innovation. In doing so, we focused on the key factors of customer co-creation, partner sourcing, and knowledge dissemination in knowledge creation. The resulting empirical model presents a richer and more nuanced understanding of how organizations can generate unique knowledge and greater innovation.

References

- Afuah, A. & Tucci, C.L. (2012). "Crowdsourcing as a solution to distant search", *Academy of Management Review*, 37(3), 355-375.
- Ahuja, G. & Katila, R. (2001). "Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study", *Strategic Management Journal*, 22(3), 197-220.
- Alavi, M., & Leidner, D.E. (2001). "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues", *MIS Quarterly*, 25(1), 107-136.
- Amit, R., & Schoemaker, P.J. (1993). "Strategic assets and organizational rent", *Strategic Management Journal*, 14(1), 33-46.
- Andersson, M., Lindgren, R., & Henfridsson, O. (2008). "Architectural knowledge in inter-organizational IT innovation", *Journal of Strategic Information Systems*, 17(1), 19-38.
- Anthony, C., M. Tripsas. (2016). Organizational Identity and Innovation. M.G. Pratt, M. Schultz, B.E. Ashforth, D. Ravasi, eds. *The Oxford Handbook of Organizational Identity*. Oxford University Press, New York, NY.
- Auh, S., Bell, S.J., McLeod, C.S. & Shih, E. (2007). "Co-production and customer loyalty in financial services", *Journal of Retailing*, 83(3), 359-370.
- Baldwin, C. & Von Hippel, E. (2011). "Modeling a paradigm shift: From producer innovation to user and open collaborative innovation", *Organization Science*, 22(6), 1399-1417.
- Barney, J.B. (2001). "Is the resource-based "view" a useful perspective for strategic management research? Yes", *Academy of Management Review*, 26(1), 41-56.
- Bawden, D., & Robinson, L. (2009). "The dark side of information: Overload, anxiety and other paradoxes and pathologies", *Journal of Information Science*, 35(2), 180-191.
- Begona Lloria, M. & Peris-Ortiz, M. (2014). "Knowledge creation. The ongoing search for strategic renewal", *Industrial Management & Data Systems*, 114(7), 1022-1035.
- Bendapudi, N. & Leone, R.P. (2003). "Psychological implications of customer participation in co-production", *Journal of Marketing*, 67(1), 14-28.
- Bogers, M., Afuah, A. & Bastian, B. (2010). "Users as innovators: A review, critique, and future research directions", *Journal of Management*, 36(4), 857-875.
- Bose, R. (2004). "Knowledge management metrics", *Industrial Management & Data Systems*, 104(6), 457-468.
- Bridges, E., Goldsmith, R.E., & Hofacker, C.F. (2005). "Attracting and retaining online buyers: Comparing B2B and B2C customers", *Advances in Electronic Marketing*, 1, 22-34.
- Bockstedt, J., Druehl, C., & Mishra, A. (2015). "Problem-solving effort and success in innovation contests: The role of national wealth and national culture", *Journal of Operations Management*, 36, 187-200.
- Burt, R.S. (2004). "Structural holes and good ideas", *American Journal of Sociology*, 110(2), 349-399.
- Caloghirou, Y., Kastelli, I. & Tsakanikas, A. (2004). "Internal capabilities and external knowledge sources: Complements or substitutes for innovative performance?" *Technovation*, 24(1), 29-39.
- Capgemini (2013). "Regulatory Changes in the Investment Banking Industry", <https://www.capgemini.com/resource-file->

- access/resource/pdf/regulatory_changes_in_the_investment_banking_industry.pdf
- Casciaro, T., & Piskorski, M.J. (2005). "Power imbalance, mutual dependence, and constraint absorption: A closer look at resource dependence theory", *Administrative Science Quarterly*, 50(2), 167-199.
- Cassiman, B. & Veugelers, R. (2006). "In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition", *Management Science*, 52(1), 68-82.
- Chang, Y.B. & Gurbaxani, V. (2012). "Information technology outsourcing, knowledge transfer, and firm productivity: an empirical analysis", *MIS Quarterly*, 36(4), 1043-1053.
- Chen, H., Chiang, R.H. & Storey, V.C. (2012). "Business intelligence and analytics: From big data to big impact", *MIS Quarterly*, 36(4), 1165-1188.
- Chesbrough, H. (2004). "Managing open innovation", *Research-Technology Management*, 47, 23-26.
- Chesbrough, H. (2011). "Bringing open innovation to services", *MIT Sloan Management Review*, 52(2), 85-90.
- Chiu, C.-M., Hsu, M.-H. & Wang, E.T. (2006). "Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories", *Decision Support Systems*, 42(3), 1872-1888.
- Conner, K.R. & Prahalad, C.K. (1996). "A resource-based theory of the firm: Knowledge versus opportunism", *Organization Science*, 7(5), 477-501.
- Corsaro, D., Cantù, C., & Tunisini, A. (2012). "Actors' heterogeneity in innovation networks", *Industrial Marketing Management*, 41(5), 780-789.
- Culnan, M.J., McHugh, P.J., and Zubillaga, J.I. (2010). "How large U.S. companies can use twitter and other social media to gain business value", *MIS Quarterly Executive*, 9(4), 243-259.
- Davenport, T.H., De Long, D.W. & Beers, M.C. (1998). "Successful knowledge management projects", *Sloan Management Review*, 39(2), 43-57.
- De Pablos, P.O. (2002). "Evidence of intellectual capital measurement from Asia, Europe and the Middle East", *Journal of Intellectual Capital*, 3(3), 287-302.
- De Reuver, M., Bouwman, H., Prieto, G. & Visser, A. (2011). "Governance of flexible mobile service platforms", *Futures*, 43(9), 979-985.
- Deeds, D.L. & Decarolis, D.M. (1999). "The impact of stocks and flows of organizational knowledge on firm performance: An empirical investigation of the biotechnology industry", *Strategic Management Journal*, 20(10), 953-968.
- Dennis, A.R., Fuller, R.M. & Valacich, J.S. (2008). "Media, tasks, and communication processes: A theory of media synchronicity", *MIS Quarterly*, 32(3), 575-600.
- Di Gangi, P.M., & Wasko, M. (2009). "Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm", *Decision Support Systems*, 48(1), 303-312.
- Dobni, C.B. (2008). "Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis", *European Journal of Innovation Management*, 11(4), 539-559.
- Dodgson, M., Gann, D. & Salter, A. (2006). "The role of technology in the shift towards open innovation: the case of Procter & Gamble", *R&D Management*, 36(3), 333-346.
- Drees, J.M., & Heugens, P.P. (2013). "Synthesizing and extending resource dependence theory: A meta-analysis", *Journal of Management*, 39(6), 1666-1698.
- Eisingerich, A.B., Rubera, G. & Seifert, M. (2009). "Managing service innovation and interorganizational relationships for firm performance to commit or diversify?" *Journal of Service Research*, 11(4), 344-356.
- Escribano, A., Fosfuri, A. & Tribó, J.A. (2009). "Managing external knowledge flows: The moderating role of absorptive capacity", *Research Policy*, 38(1), 96-105.
- Fang, E. (2008). "Customer participation and the trade-off between new product innovativeness and speed to market", *Journal of Marketing*, 72(4), 90-104.
- Fleming, L., Mingo, S. & Chen, D. (2007). "Collaborative brokerage, generative creativity, and creative success", *Administrative Science Quarterly*, 52(3), 443-475.

- Fosfuri, A. & Tribó, J.A. (2008). "Exploring the antecedents of potential absorptive capacity and its impact on innovation performance", *Omega*, 36(2), 173-187.
- Füller, J., Matzler, K. and Hoppe, M. (2008). "Brand community members as a source of innovation", *Journal of Product Innovation Management*, 25(6), 608-619.
- Gattiker, U.E., Perlusz, S., & Bohmann, K. (2000). "Using the Internet for B2B activities: A review and future directions for research", *Internet Research*, 10(2), 126-140.
- Gold, A.H., Malhotra, A. & Segars, A.H. (2001). "Knowledge management: An organizational capabilities perspective", *Journal of Management Information Systems*, 18(1), 185-214.
- Grant, R.M. (1996). "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, 17(S2), 109-122.
- Grant, R.M. & Baden-Fuller, C. (2004). "A knowledge accessing theory of strategic alliances", *Journal of Management Studies*, 41(1), 61-84.
- Gray, P.H. & Meister, D.B. (2006). "Knowledge sourcing methods", *Information & Management*, 43(2), 142-156.
- Gray, P.H., Parise, S. & Iyer, B. (2011). "Innovation impacts of using social bookmarking systems", *MIS Quarterly*, 35(3), 629-643.
- Greer, C.R. & Lei, D. (2012). "Collaborative innovation with customers: A review of the literature and suggestions for future research", *International Journal of Management Reviews*, 14, 63-84.
- Hagel, J. & Brown, J.S. (2015). "To survive, companies need to stop hiding behind their walls", *Fortune*, <http://fortune.com/2015/02/09/general-electric-companies-innovation/>.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. & Tatham, R.L., (2006). *Multivariate Data Analysis* Pearson Prentice Hall Upper Saddle River, NJ.
- Hargadon, A. & Sutton, R.I. (1997). "Technology brokering and innovation in a product development firm", *Administrative Science Quarterly*, 42(4), 716-749.
- Hawkins, C., (2013). "Barriers to entry for tech startups have gotten lower", <http://www.bizjournals.com/jacksonville/print-edition/2013/07/19/barriers-to-entry-for-tech-startups.html>.
- Herzog, P. & Leker, J. (2011). *Open and closed innovation: Different cultures for different strategies* Springer.
- Hsueh, J.-T., Lin, N.-P. & Li, H.-C. (2010). "The effects of network embeddedness on service innovation performance", *The Service Industries Journal*, 30(10), 1723-1736.
- Hu, M., Meng-Lei, Horng, J.-S. & Sun, Y.-H.C. (2009). "Hospitality teams: Knowledge sharing and service innovation performance", *Tourism Management*, 30(1), 41-50.
- Huston, L. & Sakkab, N. (2006). "Connect and develop", *Harvard Business Review*, 84(3), 58-66.
- Joshi, K.D., Chi, L., Datta, A., & Han, S. (2010). "Changing the competitive landscape: Continuous innovation through IT-enabled knowledge capabilities", *Information Systems Research*, 21(3), 472-495.
- Kandampully, J., (2002). "Innovation as the core competency of a service organisation: The role of technology, knowledge and networks", *European Journal of Innovation Management*, 5, 18-26.
- Kang, K.H. & Kang, J. (2009). "How do firms source external knowledge for innovation? Analysing effects of different knowledge sourcing methods", *International Journal of Innovation Management*, 13(01), 1-17.
- Kankanhalli, A., Ye, H.J. & Teo, H.H. (2015). "Comparing potential and actual innovators: an empirical study of mobile data services innovation", *MIS Quarterly*, 39(3), 667-682.
- Kaplan, S. (2013). "6 Ways to create a culture of innovation", *FastCompany* <http://www.fastcodesign.com/1672718/6-ways-to-create-a-culture-of-innovation>.
- Kingston, J. (2012). "Choosing a knowledge dissemination approach", *Knowledge and Process Management*, 19(3), 160-170.
- Kristensson, P., Matthing, J. & Johansson, N. (2008). "Key strategies for the successful involvement of customers in the co-creation of new technology-based services", *International Journal of Service Industry Management*, 19(4), 474-491.

- Kumar, V., Jones, E., Venkatesan, R. & Leone, R.P. (2011). "Is market orientation a source of sustainable competitive advantage or simply the cost of competing?" *Journal of Marketing*, 75(1), 16-30.
- Laursen, K. & Salter, A. (2006). "Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms", *Strategic Management Journal*, 27(2), 131-150.
- Lee, H. & Choi, B. (2003). "Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination", *Journal of Management Information Systems*, 20(1), 179-228.
- Lee, S.M., Olson, D.L. & Trimi, S. (2012). "Co-innovation: Convergencomics, collaboration, and co-creation for organizational values", *Management Decision*, 50(5), 817-831.
- Lee, Y., Madnick, S., Wang, R., Wang, F. & Zhang, H. (2014). "A cubic framework for the chief data officer: Succeeding in a world of big data", *MIS Quarterly Executive*, 13(1).
- Lewis, K., Lange, D., & Gillis, L. (2005). "Transactive memory systems, learning, and learning transfer", *Organization Science*, 16(6), 581-598.
- Li, M., Kankanhalli, A., & Kim, S.H. (2016). "Which ideas are more likely to be implemented in online user innovation communities? An empirical analysis", *Decision Support Systems*, 84, 28-40.
- Lyons, R.K., Chatman, J.A. & Joyce, C.K. (2007). "Innovation in services: Corporate culture and investment banking", *California Management Review*, 50(1), 174-191.
- Malhotra, A., Gosain, S. & Sawy, O.E. (2005). "Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation", *MIS Quarterly*, 29(1), 145-187.
- Matusik, S.F. & Heeley, M.B. (2005). "Absorptive capacity in the software industry: Identifying dimensions that affect knowledge and knowledge creation activities", *Journal of Management*, 31(4), 549-572.
- Menor, L.J. & Roth, A.V. (2008). "New service development competence and performance: An empirical investigation in retail banking", *Production and Operations Management*, 17, 267-284.
- Nambisan, S. (2002). "Designing virtual customer environments for new product development: Toward a theory", *Academy of Management Review*, 27(3), 392-413.
- Nambisan, S. & Baron, R.A. (2009). "Virtual customer environments: Testing a model of voluntary participation in value co-creation activities", *Journal of Product Innovation Management*, 26(4), 388-406.
- Nambisan, S. & Baron, R.A. (2010). "Different roles, different strokes: Organizing virtual customer environments to promote two types of customer contributions", *Organization Science*, 21(2), 554-572.
- Nan, N. (2011). "Capturing bottom-up information technology use processes: A complex adaptive systems model", *MIS Quarterly*, 35(2), 505-532.
- Newell, S. (2015). "Managing knowledge and managing knowledge work: What we know and what the future holds", *Journal of Information Technology*, 30(1), 1-17.
- Nonaka, I. (1994). "A dynamic theory of organizational knowledge creation", *Organization Science*, 5(1), 14-37.
- Nonaka, I. & Von Krogh, G. (2009). "Perspective-tacit knowledge and knowledge conversion: Controversy and advancement in organizational knowledge creation theory", *Organization Science*, 20(3), 635-652.
- Obstfeld, D. (2005). "Social networks, the tertius iungens orientation, and involvement in innovation", *Administrative Science Quarterly*, 50(1), 100-130.
- Pavlou, P.A. & Sawy, O.E. (2006). "From IT leveraging competence to competitive advantage in turbulent environments: The case of new product development", *Information Systems Research*, 17(3), 198-227.
- Pee, L.G. & Kankanhalli, A. (2009). "Knowledge management capability: A resource-based comparison of public and private organizations", *ICIS 2009 Proceedings*, 47.
- Peteraf, M.A. (1993). "The cornerstones of competitive advantage: A resource-based view", *Strategic Management Journal*, 14(3), 179-191.
- Poetz, M. K., & Schreier, M. (2012). The value of crowdsourcing: Can users really compete with

- professionals in generating new product ideas? *Journal of Product Innovation Management*, 29(2), 245-256.
- Rodan, S. & Galunic, C. (2004). "More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness", *Strategic Management Journal*, 25(6), 541-562.
- Roth, J. (2003). "Enabling knowledge creation: Learning from an R&D organization", *Journal of Knowledge Management*, 7(1), 32-48.
- Rumelt, R.P. (1991). "How much does industry matter?" *Strategic Management Journal*, 12, 167-185.
- Saldanha, T., Mithas, S. & Krishnan, M.S. (forthcoming). "Leveraging Customer Involvement for Fueling Innovation: The Role of Relational and Analytical Information Processing Capabilities", *MIS Quarterly*.
- Schricke, E. (2013). *Occurrence of cluster structures in knowledge-intensive services*. Working Papers Firms and Region.
- Schulze, T., Indulska, M., Geiger, D., and Korthaus, A. (2012). "Idea assessment in open innovation: A state of practice", *Proc. European Conference on Information Systems*, Paper 149.
- Schultze, U., Prandelli, E., Salonen, P.I. & Van Alstyne, M. (2007). "Internet-enabled co-production: Partnering or competing with customers?" *Communications of the Association for Information Systems*, 19(1), 15.
- Shah, S.K., M. Tripsas. (2016). When do user innovators start firms? A theory of user entrepreneurship. D. Harhoff, K.R. Lakhani, eds. *Revolutionizing Innovation Users, Communities, and Open Innovation*. MIT Press, Boston, MA.
- Spender, J.C. & Grant, R.M. (1996). "Knowledge and the firm: Overview", *Strategic Management Journal*, 17(S2), 5-9.
- Van Der Meer, H. (2007). "Open innovation—the Dutch treat: Challenges in thinking in business models", *Creativity and Innovation Management*, 16(2), 192-202.
- Vargo, S.L., Maglio, P.P. & Akaka, M.A. (2008). "On value and value co-creation: A service systems and service logic perspective", *European Management Journal*, 26(3), 145-152.
- Vega-Jurado, J., Gutiérrez-Gracia, A. & Fernández-De-Lucio, I. (2009). "Does external knowledge sourcing matter for innovation? Evidence from the Spanish manufacturing industry", *Industrial and Corporate Change*, 18(4), 637-670.
- Von Hippel, H. (2006). *Democratizing Innovation*. Cambridge, MA: MIT Press.
- Wadhwa, A. & Kotha, S. (2006). "Knowledge creation through external venturing: Evidence from the telecommunications equipment manufacturing industry", *Academy of Management Journal*, 49(4), 819-835.
- Wall, M. 2014. "Innovate or Die: The Stark Message for Big Business," BBC News <http://www.bbc.com/news/business-28865268>.
- Wang, Y., Meister, D.B. & Gray, P.H. (2013). "Social influence and knowledge management systems use: Evidence from panel data", *MIS Quarterly*, 37(1), 299-313.
- Wernerfelt, B., (1984). "A resource-based view of the firm", *Strategic Management Journal*, 5(2), 171-180.
- West, J., & Bogers, M. (2014). "Leveraging external sources of innovation: A review of research on open innovation", *Journal of Product Innovation Management*, 31(4), 814-831.
- Yam, R., Lo, W., Tang, E.P. & Lau, A.K. (2011). "Analysis of sources of innovation, technological innovation capabilities, and performance: An empirical study of Hong Kong manufacturing industries", *Research Policy*, 40(3), 391-402.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). "Research commentary - The new organizing logic of digital innovation: An agenda for information systems research", *Information Systems Research*, 21(4), 724-735.
- Zwilling, M. (2014). Win-win: Strategically partner with your top competitors. *Entrepreneur*. <http://www.entrepreneur.com/article/234522>

Figure 1. Research Model

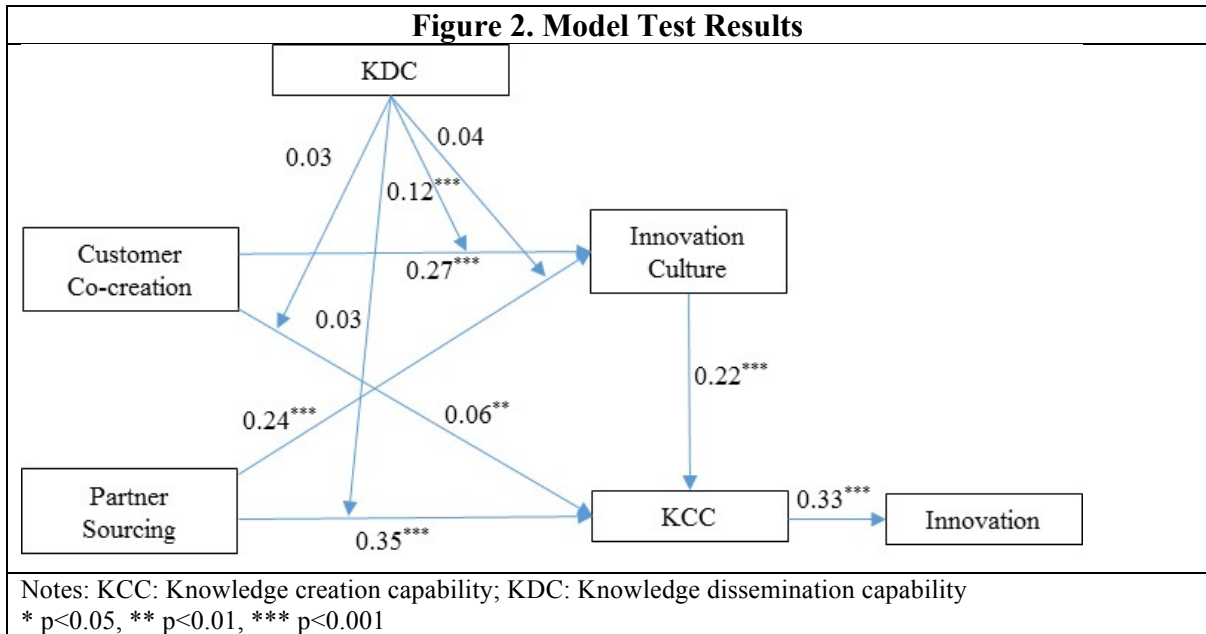
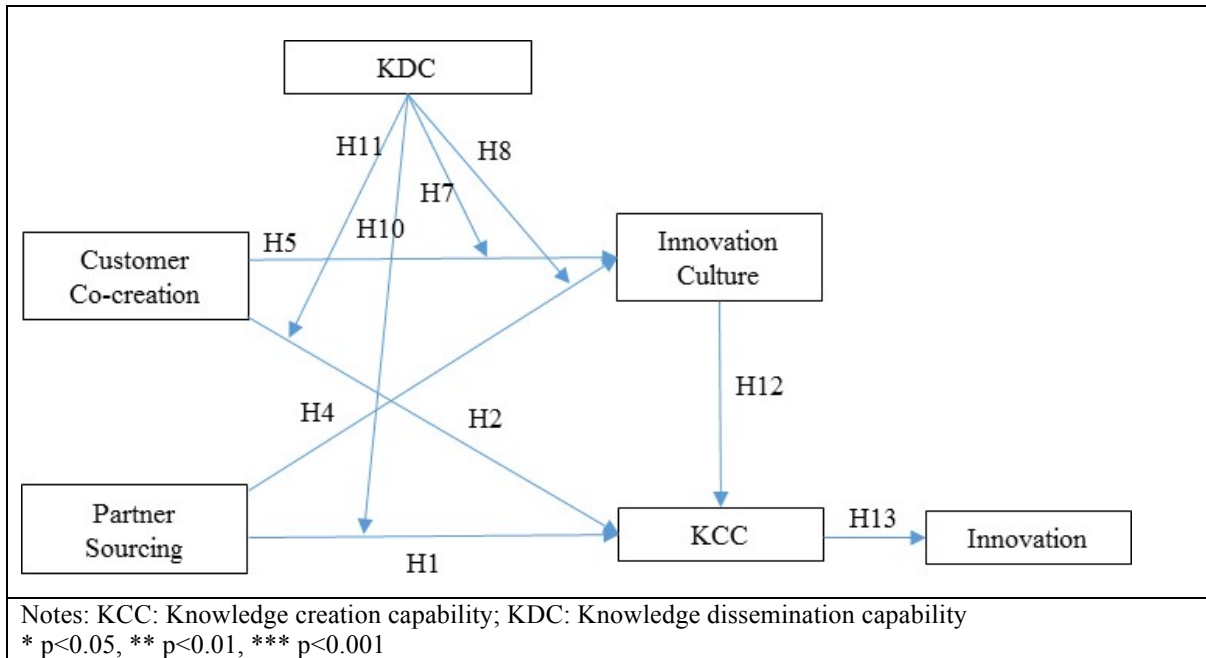


Figure 3. Interaction Plot

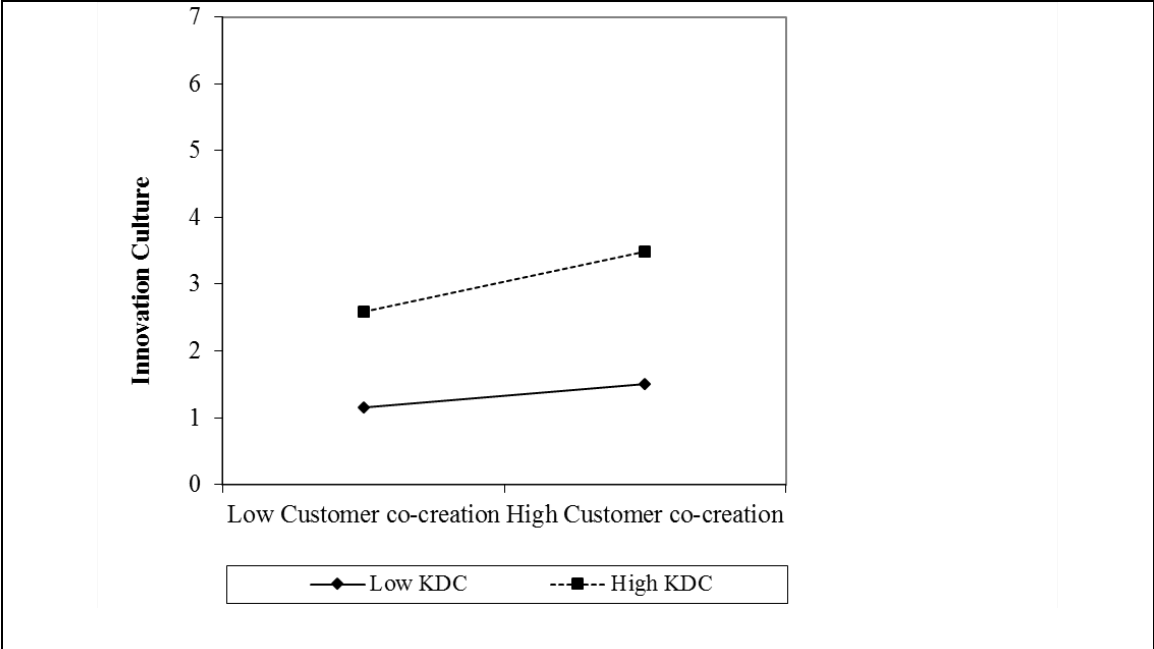


Table 1. Survey Items		
Construct	Source	Items
Partner Sourcing	Gold et al. 2001; Pee & Kankanhalli 2009	My organization has strong ability in acquiring knowledge from our suppliers
		My organization has strong ability in acquiring knowledge from our partners
		My organization has strong ability in acquiring knowledge from our competitors
Knowledge Dissemination Capability	Gold et al. 2001; Pee & Kankanhalli 2009	My organization has strong ability in distributing knowledge throughout the organization
		My organization has strong ability in transferring knowledge to individuals
		My organization has strong ability in sharing knowledge about customers when necessary
		My organization has strong ability in sharing knowledge about improving organizational performance when required
		My organization has strong ability in sharing knowledge about our work processes when required
Customer co-creation	Dobni 2008; Menor & Roth 2008; Auh et al. 2007	My organization co-defines value with our customers
		In my organization, customers are viewed as potential sources of new ideas and offerings
		In my organization, customers actively support the work of employees, ensure that the innovation process is smoothly completed
		In my organization, customers are willing to provide additional resources (time, energy, emotion, etc.) to assist the service of employees
		The development of services in my organization depends largely on customer inputs and working closely with customers on each stage of the development process
Innovation Culture	Hu et al. 2009; Bose, 2004;	In my organization innovation is an organization wide endeavor rather than being confined to a small team
		In my organization there are defined structures and processes that support innovation
		My organization provides a suitable environment for developing new services
		In my organization as an employee, I feel enabled to generate ideas
		In my organization we support the innovation process and encourage all employees to participate in it
Knowledge Creation Capability	Gold et al. 2001; de Pablos, 2002	My organization has strong ability in producing new knowledge about improving customers satisfaction
		My organization has strong ability in creating original ideas about improving organizational performance
		My organization has strong ability in creating original ideas for improving work processes
		My organization has strong ability in generating original ideas for improving products and/or services
Innovation	Ahuja and Katila 2001; Hsueh et al. 2010	What is the number of successful new patents registered by your firm in the one year period (Measured as High vs Low; High: greater than 10 and Low: less than or equal to 10)

	Construct	Mean	SD	1	2	3	4	5	6
1	Partner Sourcing	4.38	1.14	0.81					
2	Customer Co-creation	4.61	1.22	0.51 ^{***}	0.72				
3	Innovation Culture	4.36	1.46	0.54 ^{***}	0.68 ^{***}	0.75			
4	KDC	4.53	1.37	0.59 ^{***}	0.64 ^{***}	0.68 ^{***}	0.78		
5	KCC	4.49	1.43	0.67 ^{***}	0.60 ^{***}	0.69 ^{***}	0.72 ^{***}	0.68	
6	Innovation	0.34	0.47	0.11 ^{***}	0.32 ^{***}	0.18 ^{***}	0.17 ^{***}	0.20 ^{***}	0.88

Notes:
1. AVEs reported in the diagonal
2. Largest squared correlation ($0.72^2 = 0.52$) was between KCC and KDC

	IT Organizations		Financial Organizations	
	Predicting Innovation Culture	Predicting KCC	Predicting Innovation Culture	Predicting KCC
Customer Co-creation	0.24 ^{***}	0.01	0.30 ^{***}	0.06 ^{***}
Partner Sourcing	0.17 ^{***}	0.33 ^{***}	0.37 ^{***}	0.56 ^{***}
Innovation Culture		0.16 ^{***}		0.31 ^{***}
KDC	0.36 ^{***}	0.40 ^{***}	0.29 ^{***}	0.01
Customer Co-creation X KDC	0.18 ^{***}	0.15 ^{***}	0.08 ^{***}	0.03
Partner Sourcing X KDC	0.11	0.10 ^{***}	0.03	0.02

Note: * p<0.05, ** p<0.01, *** p<0.001

Appendix

	Mean	Standard Deviation
Total Work Experience of Key Respondent	14.36	2.62
Experience in Current Position of Key Respondent	7.24	1.59
Organization Size	3,697	2,618
Adequacy of R&D Investment	4.14	1.52
Adequacy of IT Investment	4.59	1.48
Slack time	4.22	1.64
Management support	4.41	1.60

Notes:
1. Work experience measured in years
2. Organization size measured as number of employees in the organization
3. Adequacy of R&D, IT investment, Slack time, and Management support measured using 1-7 Likert scale, seven being the highest