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Abstract:

Knowledge management systems (KMS) allow firms to create knowledge and improve organizational creativity to help them sustain a competitive advantage. However, we lack knowledge about the underlying mechanisms for how the different aspects of KMS-based knowledge-creation process (i.e., socialization, externalization, combination, and internalization) enhance organizational creativity and, ultimately, organizational performance. We examine organizational agility's role as a mediator between knowledge creation and organizational creativity and the subsequent effect that creativity has on organizational performance. We also analyze the moderating roles of two key knowledge characteristics, tacitness and institutionalization, in the mediation processes. We found that organizational agility mediated the effect that knowledge creation had on organizational creativity. Moreover, knowledge tacitness moderated the effect that socialization had on organizational creativity. Knowledge institutionalization, on the other hand, moderated the effects that combination and internalization had on organizational creativity. Our findings extend prior research by providing insights into the role that knowledge creation and knowledge characteristics play in stimulating organizational creativity and firm performance. We discuss our study's implications for practitioners and researchers.

Keywords: Knowledge Management, Knowledge Creation, Organizational Creativity, Organizational Performance, Organizational Agility, Moderated Mediation.

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1 Introduction

> "Knowledge and information are the tools and materials of creativity. Innovation, whether in the form of a new technological artifact or a new business model or method, is its product."
>
> —Richard Florida (2002, p. 44).

Organizations face tremendous pressures to innovate and create knowledge as their products undergo rapid cycles of production and obsolescence (Nadkarni & Narayana 2007). Knowledge management systems (KMS), information system platforms that support organizational knowledge management, have rapidly become ubiquitous as firms seek new ways to increase productivity, performance, and agility (Moqbel & Nah, 2017; Zhang & Venkatesh, 2017). Many organizations have implemented KMS to codify the knowledge that they contain to build and exploit their competitive advantages (Marwick, 2001). As such, KMS represent important platforms that allow employees to store, share, locate, retrieve, and use information resources.

Intangible intellectual assets, such as knowledge and information, have increasingly replaced physical assets as the most valuable element in organizational productivity in today's knowledge economy (Davenport & Prusak, 2000). Thus, turning their knowledge stock into profitable resource represents a crucial issue that contemporary organizations face. The knowledge management domain often constitutes a crucial responsibility of information systems (IS) managers and executives (Sprague, 1995; Swanson & Culnan, 1978), and, as such, research in knowledge management—particularly inquiries as to whether knowledge management enhances firm performance—has grown substantially in the IS area.

The practice of knowledge management (KM) builds on the premise that firm performance depends on not only tangible assets but also the organization's capabilities to create and use knowledge (Moqbel & Nah, 2017; Zhang & Venkatesh, 2017). This view suggests that the mechanism by which firms convert knowledge into capabilities and competitive advantages represents a fundamental research question for KM scholars. Previous literature has indicated that firms cannot simply maintain existing knowledge to implement known practices and to produce predictable results in dynamic, high-velocity markets (Eisenhardt & Martin, 2000). Firms must constantly generate novel and useful ideas in order to attain and sustain their competitive advantage over time (Parent, Gallupe, Salisbury, & Handelman, 2000).

Various research studies on knowledge creation, organizational creativity, and organizational performance have demonstrated the strategic value of knowledge management. For instance, Lee and Choi (2003) theorize that Nonaka's knowledge-creation processes have a positive impact on organizational performance through creativity enhancement and report empirical findings that support this theoretical position. The emphasis on the role of organizational creativity in knowledge creation raises a few interesting research questions: can an organization foster continuous creativity and improve performance through knowledge-creation processes? Through what underlying mechanism do knowledge-creation processes enhance organizational creativity and, ultimately, organizational performance? Despite its relevance, researchers have rarely formally specified the theoretical relationship between knowledge-management capabilities and organizational agility (for an exception, see Ashrafi et al., 2005). We also lack empirical support for the role that knowledge management (knowledge creation in particular) and organizational agility play in enhancing firm performance.

We build a model that extends the growing stream of work on organizational creativity and performance (Amabile, 1983; Drazin, Glynn, & Kazanjian, 1999; Ford, 1996; Woodman, Sawyer, & Griffin, 1993) by incorporating organizational agility and empirically evaluating the extended model. Our theoretical exposition that organizational agility plays a pivotal role in the relationship between knowledge creation and creativity has a firm basis in existing theories. New knowledge develops better routines that make operations more efficient and effective. Other literature also indicates that, as organizations learn from newly generated knowledge, they not only improve existing processes but also develop dynamic capabilities to integrate knowledge into creative ideas, novel solutions, and new products and services (Eisenhardt & Martin 2000; Hargadon & Sutton, 1997).

In this research, we also examine whether the effect that knowledge-creation processes has on organizational learning depends on the nature of an organization's knowledge. Based on the common understanding that tacit and explicit knowledge differ substantially in their codifiability and transferability, we examine the moderating role of knowledge characteristics in the process of using knowledge management to foster organizational creativity.

To summarize, we show that knowledge creation enhances organization creativity through improved organizational agility. Organizational creativity, in turn, positively impacts firm performance. Our model also indicates that the mediating process depends on the knowledge's characteristics (i.e., tacitness and institutionalization).

The paper proceeds as follows: in Section, 2 we critically synthesize existing literature on the role of knowledge-creation processes as a competitive capability by reviewing Lee and Choi's (2003) model of knowledge creation, creativity, and firm performance. Based on that discussion, we develop a theoretical model that includes the mediating role of organizational agility and moderating factors that facilitate organizational creativity and organizational performance. In Sections 3 and 4, we describe our research design and discuss how we tested the conceptual model in an empirical study. In Section 5, we describe the results. Finally, in Section 6, we discuss our study's implications for knowledge management researchers and practitioners who review and consider KMS adoption in organizations

2 Theoretical Background

2.1 Knowledge Creation as a Competitive Capability

From a resource-based view of the firm (Wernerfelt, 1984), only a subset of resources that a firm owns allows it to achieve a competitive advantage. An even smaller subset leads to long-term performance gains (Barney, 1991; Grant, 1991). These advantage-creating resources, which researchers commonly define as "assets and capabilities that are available and useful in detecting and responding to market opportunities or threats" (Wade & Hulland 2004, p. 109), are valuable, rare, non-imitable, and non-substitutable (Barney, 1991).

Knowledge that all firms can access or that industry players commonly share among themselves rarely meets these criteria. Internally created knowledge is more likely to lead to innovation than knowledge acquired through imitation (Bolton, 1993). Therefore, Conner and Prahalad (1996) argue that only privately held knowledge becomes a valuable asset for competitive advantage. In fact, firms gain much organizational knowledge from borrowing rather than inventing it (March & Simon, 1958). When firms acquire or transfer knowledge from external sources, however, it is unlikely to be rare enough to create differences substantial enough to give the firm a competitive edge unless the firm combines it with unique knowledge it has generated itself (Zack, 1999a).

In contrast, knowledge that firms create internally has a higher chance to become a valuable resource because competitors cannot as easily access and imitate it (Zack, 1999a). As Leonard-Barton (1992) demonstrate, managerial systems for knowledge creation form an important dimension of core capabilities because they enable an organization to learn. Learning plays a critical role in the process of developing valuable knowledge internally. This perspective implies that one can conceptualize organizational activities that promote knowledge creation as an important knowledge-management capability for establishing knowledge asymmetry, converting resources into performance, and resulting in competitive advantages (Tanriverdi, 2005).

2.2 Knowledge-creation Processes

We define knowledge creation as a firm's capability to form new knowledge due to processing information and knowledge that it already owns (Nonaka, 1994; Nonaka, Byosiere, Borucki, & Konno, 1994). This capability is enabled by KMS processes through which firms can create knowledge by converting tacit into explicit knowledge at the individual, group, organizational and inter-organizational levels (Nonaka, 1994). Along the tacit-explicit dimension, the core of Nonaka's theory includes four major processes for knowledge creation: socialization, externalization, combination, and internalization.

Socialization, or knowledge exchange (Moran & Ghoshal, 1996; Nahapiet & Ghoshal, 1998), refers to converting tacit knowledge into new forms of tacit knowledge through human interactions. Since individuals cannot easily share and exchange tacit knowledge due to its nature, they usually do so socially through apprenticeship, collaboration, and brainstorming sessions. Knowledge created through these social exchanges often continues to remain tacit in nature. The mentoring program at the Kennedy Space Center exemplifies a socialization process whereby senior and junior engineers exchange and create tacit knowledge (Sabherwal & Becerra-Fernandez, 2003). Similarly, communities of practice at IBM generate new ideas, products, and practices through socialization as they mature (Gongla & Rizzuto, 2001).

Externalization, on the other hand, refers to articulating tacit knowledge into an explicit form that others can more easily access (Nonaka, 1994). Externalizing insights gained through events that occur infrequently produces enormous amounts of learning (Zollo & Winter, 2002), whereas externalizing routines or procedures performed on a regular basis allows firms to capitalize on reuse economies (Hansen, Nohria, & Tierney, 1999). Metaphors, imagery, body language, and other tools of symbolic communication all allow one to convert tacit knowledge into an explicit format. Software programmers, for instance, explicate their tacit knowledge through computer code and documentation.

In contrast, combination and internalization represent methods to create new knowledge from existing explicit knowledge. Combination refers to creating new explicit knowledge by organizing, synthesizing, updating, and purifying existing explicit knowledge. For example, a firm can create comprehensive customer profiles by combining existing customer reports from different departments. Other researchers have also argued that combination constitutes one of the two main processes through which firms create all new resources, which includes knowledge (Moran & Ghoshal, 1996; Nahapiet & Ghoshal, 1998). A firm's "combinative capabilities" (Kogut & Zander, 1992) by which it synthesizes knowledge resources and generates new applications offers an important source of dynamic capabilities (Eisenhardt & Martin, 2000).

Finally, internalization occurs when one transforms explicit knowledge into tacit knowledge through practice, physical operations, or bodily experience. For example, from reading a document, a success story, or a new policy, an employee can develop a new mental model that tacitly encodes the new knowledge as a result of internalizing the reading materials (Nonaka & Takeuchi, 1995).

2.3 Knowledge Creation and Organizational Performance

For these knowledge-creation processes constitute valuable firm resources, they must be able to generate sustained performance. Conceptually, knowledge creation does not differ that much from Grant's (1996) notion of knowledge integration, where complex yet productive activities among members of specialist teams allow a firm to harness and integrate new insights generated through integrating diverse sources of knowledge. Grant (1996) has presented compelling arguments for why competitive advantage results from knowledge-integration processes. The current literature provides empirical evidence that knowledge-creation processes can indeed enhance knowledge-management satisfaction (Becerra-Fernandez & Sabherwal, 2001) and organizational performance (Lee and Choi 2003). Researchers have linked organizational knowledge that firms create internally, such as products in the pipeline and firm citations in biotechnology firms, to positive firm performance (DeCarolis & Deeds, 1999). However, a key question remains: what mechanisms underlie the relationship between knowledge-creation processes and organizational performance?

2.4 The Impact of Organizational Creativity: Existing Model

One theory interprets the impact that knowledge-creation capability has on firm performance through the lens of organizational creativity, which we define here as the organization's orientation towards inventiveness, adoption of new behaviors, and receptivity and openness to new ideas (Hurley & Hult, 1998; Menon, Bharadwaj, Adidam, & Edison, 1999; Woodman et al., 1993). Organizations with an open flow of communication, propensity for risk taking, leadership style that encourages participation, discussion and divergent thinking, and organizational climate that discourages groupthink have a better chance to foster employees that produce creative outputs (Amabile, Conti, Coon, Lazenby, & Herron, 1996). These organizations not only more receptively view creative suggestions and ideas but also demonstrate a stronger disposition toward the risk and uncertainty associated with adopting products that employees create via creative actions (Shapira, 1995).

While knowledge-creation processes help a firm develop new knowledge, organizational creativity represents its propensity to adopt new behaviors and ideas. In other words, knowledge-creation processes demonstrate a firm's emphasis on organizational learning, whereas organizational creativity reflects a firm's ability to recognize and absorb new ideas and its willingness to take risks associated with implementing these ideas (Ford, 1996).

Ford (1996) argues that two conditions particularly influence a firm's ability to perform creative actions: its absorptive capacity and its disposition toward risk. In this framework, knowledge-creation processes encourage firms to develop organizational creativity by enhancing their absorptive capacity and risk disposition.

First, when firms implement knowledge-creation processes, they promote an explicit emphasis on learning. When firms encourage their organizational members to convert tacit ideas into explicit forms or to combine ideas into new ones, learning takes place as employees develop a deeper understanding of new ideas and, consequently, a stronger desire for implementing new ideas. This learning process also infuses a culture that accepts novel insights into the firm, which promotes an organizational climate that is more conducive to implementing new ideas despite potential failure (Hurley & Hult, 1998).

Furthermore, knowledge-creation processes expand a firm's knowledge base, an antecedent condition for it to adopt and implement innovative ideas (Damanpour, 1991). When firms have plentiful knowledge resources, they can more easily absorb new ideas (Cohen & Levinthal, 1990). Consequently, they can understand new ideas more easily and are more likely to establish procedures for developing and implementing these ideas (Dewar & Dutton, 1986). Finally, knowledge-creation processes encourage members in various functional departments to communicate and exchange ideas among themselves, which facilitates internal communication. In turn, such communication enhances the degree to which firms adopt innovative ideas and such ideas disperse through the organization, which creates a context that helps new ideas to survive (Damanpour 1991; Ross, 1974).

This perspective explains Lee and Choi's (2003) conjecture that knowledge-creation processes boost organizational creativity, which, in turn, increases firm performance. The way they conceptualize organizational creativity concurs with how we conceptualize it in that both conceptualizations focus specifically on the organization's openness to new ideas and willingness to develop and implement innovative products or services. Indeed, when a firm encourages its employees to engage in knowledge-creating activities, such as gathering information, sharing experiences, and documenting meeting discussions, these activities provide opportunities for divergent thinking and innovative problem solving. Lee and Choi (2003) have empirically demonstrated that a stronger innovative culture is positively associated with all four knowledge-creation domains. Other researchers have also shown the rate at which a firm introduces new products and services to reflect its knowledge-creation capabilities (Smith, Collins, & Clark, 2005). Thus, we hypothesize:

H1: Knowledge creation positively enhances organizational creativity.

The literature has well established the impact that organizational creativity has on organizational performance, which we define as the degree to which firms achieve their desired goals and performance measures such as increased efficiency and revenue growth relative to their industry competitors (Lee & Choi, 2003). Hurley and Hult (1998) posit that organizational creativity affects a firm's innovative capacity, which, in turn, critically determines the firm's competitive advantage and performance. One can find much empirical evidence that supports the linkage between the two constructs in the literature. For instance, in surveying 85 public libraries in the Northeastern region of the United States (US), Damanpour and Evan (1984) found that organizational innovation positively affected organizational performance. Similarly, in surveying 141 banks in the Midwest region of the US, Subramanian and Nilakanta's (1996) confirmed a positive relationship between organizational innovativeness and organizational performance. Lee and Choi (2003) also reported a positive association between these two variables in a wider range of industries. Thus, we hypothesize:

H2: Organizational creativity positively enhances organizational performance.

2.5 An Organizational Agility View: The Proposed Model

Knowledge-creation processes not only promote a higher level of organizational creativity but also create a competitive advantage by enhancing an organization's agility. Following Sambamurthy, Bharadwaj, and Grover (2003), we define organizational agility as "the ability to detect opportunities for innovation and seize those competitive market opportunities by assembling requisite assets, knowledge, and relationships with speed and surprise" (p. 245). In this section, we elaborate on the mechanism through which knowledge-creation processes enhance organizational agility. At the same time, we specify how agility promotes organizational creativity. More specifically, we argue that the relationship between knowledge creation and organizational creativity depends on organizational agility. Specifically, we argue that two knowledge characteristics (namely, tacitness and institutionalization) play important moderating roles in knowledge-creation processes (see Sections 2.6 and 2.7).

2.6 The Mediating Role of Organizational Agility

As contemporary organizations adapt to hypercompetitive environments, organizational agility, or their ability to sense environmental changes and respond to them appropriately with speed and intensity (Overby, Bharadwaj, & Sambamurthy, 2005), becomes increasingly crucial for firm survival (D'Aveni, 1994; Sambamurthy et al., 2003). Our analysis of the literature reveals that the relationship between knowledge-creation processes and organizational creativity, as Lee and Choi (2003) have reported, may be understood as a consequence of increased organizational agility.

While Sambamurthy at al. (2003) argue that strategic information technology (IT) provides a platform for agility, we suggest that knowledge-creation processes similarly supply a solid basis for agility. Knowledge-creation processes increase organizational agility because they enhance an organization's knowledge reach and richness. The level of knowledge reach and richness significantly determines an organization's agility as current and substantive knowledge stock allows organizations to make quick decisions with a high degree of certainty notwithstanding change and uncertainty in the environment. People and information constitute key differentiators in the presence of agile competition, and knowledge-creation processes allow firms to maximally mobilize these intellectual resources.

New knowledge generated via knowledge-creation processes contributes to a firm's digital knowledge capital, "the IT-enabled repository of knowledge and the systems of interaction among organizational members" that allow these members to share their expertise and perspectives (Sambamurthy et al., 2003, p. 247). Organizational members can digitally transmit, for example, knowledge codified through the externalization process to a broader set of functional units and organizational members across geographical boundaries. Thus, they can reach a more diverse audience that can benefit from such knowledge. For example, semiconductor design companies implement eCatalogs and design repositories (i.e., IT applications that the semiconductor community uses to inventory existing design products) to support communication and collaboration efforts when developing new products (Donnelan & Kelly, 2005). These applications provide a common platform to support various knowledge-creation processes. As such, they create greater knowledge reach by helping an organization better recognize designs that it can reuse and to enhance the visibility of internal design products in the broader marketplace. An organization requires greater access to its industry's knowledge base to quickly translate design concepts into marketable products and to "move quickly from one temporary advantage to another" in an industry with a fast clock-speed (Donnelan & Kelly, 2005, p. 266).

At the same time, insights derived from knowledge-creation processes enrich the quality of a firm's digital knowledge capital. Socialization, for instance, enables organizational members to share and develop tacit knowledge that forms a rich basis for intellectual capital. Combination, on the other hand, engages organizational members in idea exchanges that inspire them to take new perspectives, which also enhances the richness of the firm's knowledge (Sambamurthy et al., 2003). Peer reviews are an important part of knowledge creation processes when developing new products to ensure the quality of knowledge products and justify design decisions (Donnelan & Kelly, 2005; Nonaka & Takeuchi, 1995).

Greater knowledge reach and richness that knowledge-creation processes foster enable stronger organizational agility (Sambamurthy et al., 2003). Externally, enriched knowledge allows a firm to more accurately detect a relevant change in the environment (e.g., market opportunities, or evolving customer needs) and to more quickly comprehend what such events mean. This enhanced speed in perception and comprehension represents a key element in organizational agility. Internally, greater knowledge reach and richness promote tighter integration and coordination across functional units. This higher level of rapid coordination allows a firm to respond quickly as soon as it senses significant changes or critical events in the environment (Sambamurthy et al., 2003). Moreover, a constant supply of new knowledge from well-established knowledge-creation processes helps a firm build a solid knowledge base for continuously creating small and short-term advantages. The know-how advantages from having a strong knowledge base enable firms to quickly outmaneuver competitors and to gain timing advantages (D'Aveni, 1994).

Organizational agility, in turn, stimulates organizational creativity that welcomes new ideas and encourages risk taking and experimentation. As Glynn (1996, p. 1095) state: "Innovation is intendedly adaptive, and it is undertaken typically in response to unfamiliar, unexpected, or non-routine problems". An agile organization senses problems and unexpected changes that arise in the environment and develops appropriate response plans and executes them in a timely manner. An agile organization often responds innovatively. The ability to sense problems quickly and identify proper solutions accurately gives agile organizations a higher degree of certainty in adopting and implementing innovative ideas. In other words, agile organizations can better

deal with the risks associated with creativity not because they have strong tolerance for risks but because their solid operating capabilities enable them to commit the right resources and to act with maximal speed and confidence (Overby et al., 2005; Sambamurthy et al., 2003).

To summarize, we present a theoretical model to illustrate the mechanism that underlies the impact that knowledge-creation processes have on firm performance. Specifically, we argue that knowledge-creation processes promote organizational creativity, which results in superior firm performance. Moreover, organizational agility potentially mediates this relationship. With these ideas linked together, the mechanism through which knowledge-creation processes stimulate organizational creativity becomes clear. When an organization develops stronger agility through knowledge-creation processes, it also becomes more receptive to creative solutions. In this process, organizational agility plays a critical role between knowledge-creation processes and the resulting innovative culture. Thus, we hypothesize:

H3: Organizational agility mediates the relationship between knowledge-creation processes and organizational creativity.

2.7 The Moderating Role of Knowledge Characteristics

Importantly, we also extend Nonaka's (1994) model by including contingency factors. Although Nonaka's model describes four possible forms of knowledge creation, we can conceive that, in most settings, only a subset of these activities presents an optimal fit with a given organization. The existing literature has not adequately investigated the contingencies under which knowledge-creation processes have more value. Thus, by including contingency factors in our model, we not only increase the theory's predictive power but also make the model a more useful tool for practitioners when deciding the activities that they should concentrate on in their knowledge-creation efforts.

Nonaka's (1994) knowledge-creation theory provides a strong rationale that the nature of an organization's knowledge may be an important contingency variable for the effects of knowledge creation. The theory describes two key knowledge dimensions: the epistemological dimension and the ontological dimension. The former represents the distinction between tacit and explicit knowledge that Polanyi (1966) makes, and the ontological dimension cuts through personal, group, organizational, and inter-organizational levels of creation activities. This conceptualization suggests that organizations can vary along these two dimensions in terms of the nature of the primary business knowledge they manage—tacitness and institutionalization (Bhatt, 2002; Spender, 1996). Therefore, systematic differences in knowledge characteristics along these two dimensions could amplify or diminish the effects of certain knowledge-creation processes. In Sections 2.7.1 and 2.7.2, we develop a rationale for using those two knowledge characteristics as contingency variables in our research model.

2.7.1 Tacitness

As defined by Polanyi (1966) and subsequently modified and elaborated by Nonaka (1994), tacitness represents the degree to which one cannot express knowledge objectively or concretely using symbols such as words or numbers. Like Cabrera and Cabrera's (2002) "degree of articulation," tacitness captures variability along the epistemological dimension but in the opposite direction. Highly tacit organizational knowledge is either highly personal or deeply engrained in routines or organizational memory. One cannot easily explicate it into a form that allows one to easily share and communicate it. Intuition and insight, for example, constitute highly tacit knowledge. Their roots lie in personal action and experience, and individuals' personal values, goals, and emotions deeply influence them. The bread-making company that Nonaka and Takeuchi (1995) describe possesses largely tacit organizational knowledge.

In contrast, one can systematically express organizational knowledge with low tacitness (or, in other words, more explicit information) with symbolic representation. Individuals can share and communicate such knowledge via exchanging information, documents, scientific formulas, and standard operating procedures. Explicit knowledge lacks a personal nature, and one can more easily detach it from personal values or emotions. For instance, fast food restaurants provide easily understood and explicit procedures for assembling hamburgers. Such firms that specialize in assembling well-defined products possess largely explicit organizational knowledge.

Because the four knowledge-creation processes involve the interaction and transformation between tacit and explicit knowledge, their significance by definition depends on knowledge's tacitness (or lack thereof) in an organization. Socialization and internalization, processes that create tacit knowledge, should be critical for firms that rely on tacit knowledge for their success. Alternatively, they could create opportunities for

innovation and competitive advantage for firms that normally rely on explicit knowledge. Externalization and combination, on the other hand, should be more critical for firms that rely on explicit knowledge for their success as these two processes create more explicit knowledge. At the same time, they could offer a source of creative competitiveness for firms that manage highly tacit knowledge. These arguments concur with Hansen et al.'s (1999) view that knowledge-management strategies should fit an organization's needs for knowledge. They suggest that companies that rely on tacit knowledge should focus on personalization strategies, whereas companies that manage explicit knowledge should develop strategies that concur more with the codification approach. Thus, we hypothesize:

H4: The degree of tacitness of an organization's critical knowledge moderates the effect that knowledge-creation processes have on organizational creativity as mediated by organizational agility.

2.7.2 Institutionalization

Although individuals usually create knowledge, individual knowledge becomes assimilated into and eventually captured in organizational structures and routines as the basis of organizational knowledge over time (Spender, 1996). Organizations differ in terms of the extent to which they can assimilate this knowledge (Cabrera & Cabrera, 2002). Highly institutionalized knowledge includes knowledge in structures, routines, standard operating procedures, technology, and coordination. For example, fast-food franchises such as pizza delivery chain stores have developed highly institutionalized organizational knowledge. These organizations have deeply embedded routines, procedures, and technology to make pizzas and provide services in the form of standard operation procedures (SOP). The departure of any given pizza cook should cause little disruption in a store's operation. Conversely, less institutionalized knowledge includes knowledge that individual employees possess that others cannot commonly access. For example, master bread makers in specialty bakeries and creative designers in fashion houses usually possess highly personalized knowledge (Nonaka & Takeuchi, 1995). The way we conceptualize institutionalization here concurs with Spender's (1996) personal-social dimension along which knowledge varies.

Sabherwal et al. (2003) have empirically established that different knowledge-creation processes lead to varying degrees of perceived knowledge-management effectiveness at the individual, group, and organizational levels. Internalization and externalization facilitates perceived knowledge-management effectiveness at the individual level, whereas combination enhances it at the organizational level. These findings concur with the theory that knowledge creation has a higher impact on perceived knowledge-management effectiveness as the creation processes occur at a higher ontological level such as the organization as Nonaka's (1994) spiral model illustrates. In other words, if an organization heavily relies on knowledge embedded in it, certain knowledge-creation processes should have even more significant consequences. Thus, we hypothesize:

H5: The degree of institutionalization of an organization's critical knowledge moderates the effect that knowledge-creation processes have on organizational creativity as mediated by organizational agility.

We summarize the theoretical discussion thus far and the resulting hypotheses in our research model (see Figure 1). We describe how we operationalized individual elements in the model and designed an empirical study in Section 3.

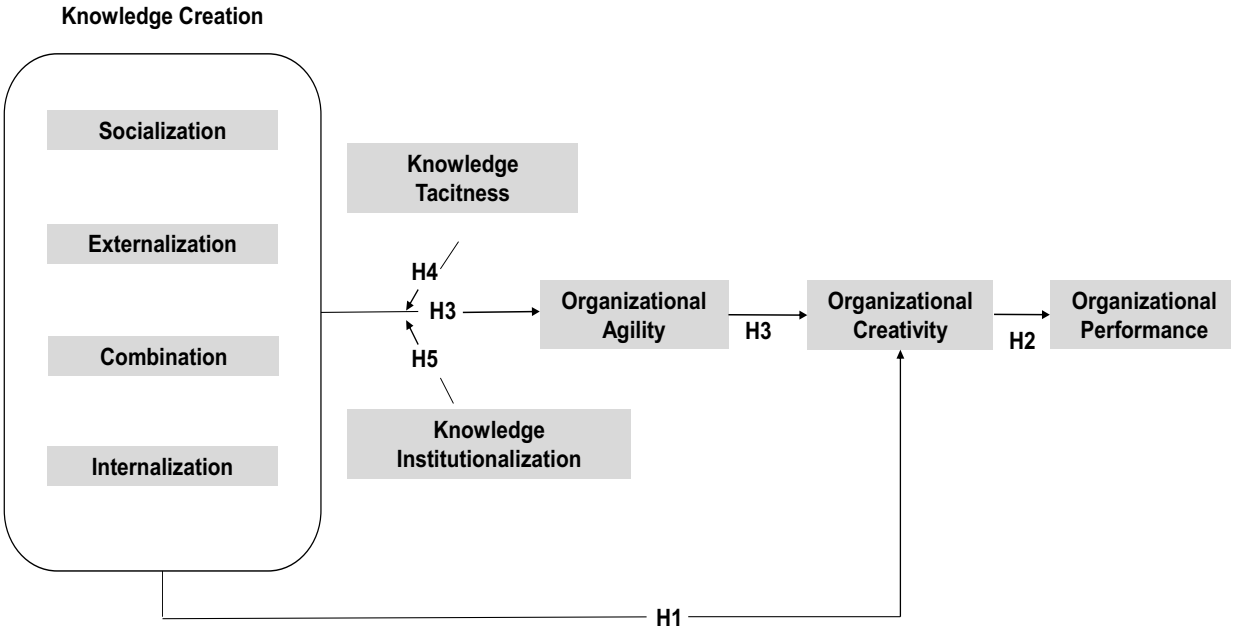

Figure 1. Research Model

3 Research Design

Since we extend Lee and Choi's (2003) work in this study, we used their research model as our benchmark (see Hypotheses 1 and 2) and then examined whether the extended model with organizational learning as a mediator could better interpret the empirical data.

3.1 Construct Operationalization

Given our theoretical model, we measured four groups of variables: 1) knowledge-creation processes in terms of socialization, externalization, combination, and internalization; 2) organizational agility; 3) knowledge characteristics in terms of tacitness and institutionalization; and 4) organizational performance. We describe these measurements in Sections 3.2 to 3.6. We list the actual survey items in the Appendix.

3.2 Knowledge-creation Process (Predictor Variable)

We adapted 24 items in total from developed and validated instruments in the literature (Becerra-Fernandez & Sabherwal, 2001; Lee & Choi, 2003; Nonaka et al., 1994; Sabherwal & Becerra-Fernandez, 2003) to measure knowledge-creation processes. Six items measured socialization by examining the extent to which individuals in an organization share tacit knowledge with others through joint activities. Another six items measured externalization by evaluating the degree to which individuals in an organization convert tacit knowledge into explicit knowledge via using metaphors, analogy, imagery, and body language. The next six items assessed combination in terms of the extent to which individuals in an organization convert existing explicit knowledge into new forms of explicit knowledge through synthesis, organization, updating, and purification. The last six items measured internalization by examining the degree to which individuals in an organization convert explicit knowledge into new forms of tacit knowledge through hands-on practices and action.

3.3 Organizational Creativity (Predictor Variable)

We adapted five items to measure organizational creativity from Lee and Choi (2003), who derived and validated the items from the existing literature.

3.4 Organizational Agility (Mediator)

We adapted 12 items measuring organizational agility from Gold, Malhotra, and Segars (2001). These authors originally designed these items to measure the extent to which organizations experience learning effects and improve their effectiveness due to increased knowledge-management capabilities (Tanriverdi, 2005). Since these items focus on improvements in areas such as coordination efforts, the ability to anticipate surprises, and responsiveness to market change, they are particularly appropriate for measuring organizational agility in our research. These measurement items compare to the ones that Sambamurthy, Wei, Lim, and Lee (2007) used to measure organizational agility.

3.5 Knowledge Characteristics (Moderator)

We developed original measures for knowledge tacitness and institutionalization for this study. We define tacitness as the extent to which individuals can express an organization's most critical knowledge in words or numbers objectively and concretely. We define institutionalization as the extent to which an organization contains its most critical knowledge in its operational procedures, policies, standard operations, and routines. To the best of our knowledge, no generally accepted items for measuring tacitness and institutionalization exist, so we developed our own instruments. For some such instruments, we relied on the extant literature (Ambrosini & Bowman, 2001; Leonard-Barton, 1995) and on existing measures, such as Zander and Kogut's (1995) measures that assess knowledge codifiability and Haas and Hansen's (2005) measures that assess sales proposals' knowledge tacitness.

3.6 Organizational Performance (Dependent Variable)

The extant literature presents multiple methods to measure organizational performance. However, one can seldom use such methods to obtain data about organizational performance due to its sensitivity. Even when one can find such data, systematic errors may arise from firm-level differences such as accounting procedures (Dess & Robinson, 1984; Venkatraman & Ramanujan, 1987). The existing literature has also reported that subjective measures of return on investment and sales growth have a significant correlation with their objective measures, which prompted Dess and Robinson (1984) to recommend that one use subjective measures in the absence of objective data. Following this recommendation and common practice in the literature (e.g., Lee & Choi, 2003), we used subjective measures to assess organizational performance.

We adapted eight items from instruments that Youndt, Snell, Dean, and Lepak (1996), Delaney and Huselid (1996), and Lee and Choi (2003) developed. These items probed how participants evaluated their organization's relative performance as compared with the organization's competitors.

4 Data and Method

We distributed survey instruments to 414 representatives in the top 1,000 enterprises in Taiwan according to the CommonWealth Magazine[1] when the representatives participated in an extended education program that their companies sponsored. CommonWealth Magazine rankings are based on firm revenue and offer a representative profile of Taiwanese businesses. The education program selected all participants based on their substantive amount of work experience with their organizations; as such, they could provide useful information regarding the survey questions.

Of those surveyed, 147 filled out and returned the questionnaire, out of which 134 respondents completed the survey without missing or invalid data (an effective response rate of 32.4%). Our sample represented organizations in the service sector (N = 63, 47.01%), manufacturing (N = 41, 30.60%), finance (N = 9, 6.72%) and others (N = 21, 15.67%). More than a third of the organizations had established formal positions or units for knowledge-management activities (N = 50, 37.31%). Most importantly, all organizations had implemented knowledge-management systems in some fashion.

The majority of the respondents (N = 58, 43.28%) had worked for their organizations for three to five years, 30.60 percent had worked for six to 10 years, 17.16 percent had worked for 11 to 15 years, and 8.96 percent had worked for more than 15 years. The study informants' extensive work experience in their respective organizations suggests that they assessed their organizations in a reasonably valid way.

[1] https://commonwealthmagazine.org/

To ascertain that the respondent firms did not significantly differ from those who did not, we compared these two groups with respect to their industries, CommonWealth rankings, and financial performance. We found no significant difference, which suggests that non-response bias did not pose a concern in this study.

4.1 Measurement Validation

We summarize the descriptive statistics for the variables such as mean, standard deviation, number of item for each construct, and intercorrelations in Tables 1 and 2. In this section, we evaluate potential biases from common method variance and validate the measurement model (Straub, Boudreau, & Gefen, 2004).

Table 1. Construct Intercorrelations

Construct	1	2	3	4	5	6	7	8	9
1. Socialization	1.00								
2. Externalization	.72**	1.00							
3. Combination	.66**	.77**	1.00						
4. Internalization	.73**	.72**	.70**	1.00					
5. Agility	.62**	.66**	.69**	.69**	1.00				
6. Creativity	.56**	.52**	.57**	.61**	.78**	1.00			
7. Performance	.57**	.56**	.58**	.56**	.70**	.59**	1.00		
8. Tacitness	-.48**	-.54**	-.46**	-.39**	-.31**	-.25**	-.32**	1.00	
9. Institutionalization	.207*	0.16	0.10	0.12	.21**	.22*	0.86	0.19	1.00

Note: ** significant at 0.01 level; * significant at 0.05 level

Table 2. Construct Measurement and Reliability

Construct	Mean	SD	Cronbach's alpha	AVE	CR
1. Socialization	4.82	0.85	0.86	0.61	0.90
2. Externalization	4.41	0.98	0.89	0.65	0.91
3. Combination	4.27	1.14	0.92	0.71	0.94
4. Internalization	4.67	0.97	0.85	0.58	0.89
5. Agility	4.60	0.97	0.95	0.66	0.96
6. Creativity	4.60	0.89	0.89	0.69	0.92
7. Performance	4.50	0.98	0.94	0.70	0.95
8. Tacitness	3.26	1.01	0.77	0.81	0.90
9. Institutionalization	4.28	0.55	0.62	0.57	0.80

4.2 Common Method Variance

As with all studies using self-reported survey data from single respondents, common method variance poses a potential concern. To determine the extent to which common method variance affected our study, we conducted a Harman's single-factor test using a principle component analysis of all the variables we measured (Podsakoff & Organ, 1986; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Results indicate the presence of 12 components, which suggests that common method variance did not likely affect our study.

4.3 Reliability and Validity

For measurement items that we adapted from existing instruments (i.e., items for all constructs except for knowledge tacitness and knowledge institutionalization), we assessed reliability in terms of item reliability and internal consistency. A partial least squares (PLS) analysis of the measurement model showed that most items loaded on their intended constructs with loadings of at least 0.7, which suggests satisfactory individual item reliability (Hulland, 1999).

Table 1 shows that all constructs with existing measures had a Cronbach's alpha of at least 0.7 or a high level of internal consistency (Nunnally, 1978). However, Cronbach's alpha assumes that items have an identical correlation with their intended constructs, an assumption that may not apply in oue study. Average variance extracted (AVE), on the other hand, represents an alternative way to assess internal consistency (Chin, 1998; Chin & Marcolin, 1995) that allows items to be weighted differentially with respect to the intended latent construct. Table 1 shows that AVE values ranged between 0.583 and 0.712—above the minimum level that Chin (1998) recommends (i.e., 0.5). In other words, the latent constructs accounted for at least 50 percent of the variance in the items. The square roots of these AVE scores were greater than the corresponding intercorrelations, which suggests satisfactory discriminant validity. In summary, our results suggest the measurement items we adopted from the existing literature were reliable and valid.

As we discuss in Section 3, we developed original measures for knowledge tacitness and institutionalization for this study. We analyzed these items with a principle components analysis and, subsequently, the VARIMAX orthogonal rotation. We extracted two factors with Eigenvalues greater than one from these eight items for knowledge characteristics. One factor emerged with two items that appeared to tap into knowledge tacitness, whereas the other factor emerged with three items that appeared to tap into knowledge institutionalization. We then entered these items into a confirmatory factor analysis.

We report the resulting reliability and validity measures for these two constructs in Table 1. Tacitness demonstrated a high level of internal consistency (Nunnally, 1978) with a Cronbach's alpha of 0.766. However, institutionalization demonstrated only a moderately satisfying level of internal consistency in terms of Cronbach's alpha (0.620). The AVE values for tacitness and institutionalization, which exceeded the minimum 0.5 cutoff that Chin (1998) recommends, showed that both measures displayed internal consistency (0.812 and 0.569, respectively). In other words, the latent constructs accounted for at least 50 percent of the variance in the items. The square roots of these AVE scores were greater than the corresponding intercorrelations, which suggests satisfactory discriminant validity. In summary, our results suggest that the measurement items for tacitness and institutionalization were reliable and valid.

5 Analysis and Results

After validating the data that we collected from the survey, we evaluated the structural relationships in the research model. We first used our data to test Lee and Choi's (2003) empirically established benchmark model. With this analysis, we could verify the integrity of our measurements as compared with existing research. Next, we continued to test the extended organizational learning model. In order to evaluate statistical significance of the path coefficients, we used the bootstrapping approach in PLS, a nonparametric technique for estimating structural paths (Efron & Tibshirani, 1993). Finally, we tested the hypothesized moderated mediation effects using multiple regression analyses.

5.1 Base Model Verification

We show the PLS results for verifying the benchmark model in Figure 2. The results concur with Lee and Choi's (2003) findings, and most knowledge-creation processes significantly affected organizational creativity. Among the creation activities, we found only externalization did not have impact on organizational creativity. The positive relationship between knowledge-creation processes and organizational creativity empirical supports existing relationships in the benchmark model. We also found organizational creativity to significantly affect organizational performance. Thus, we found support for H1 and H2. Our findings demonstrate the validity of Lee and Choi's (2003) model, and our measurement and structural models concur with findings in previous literature.

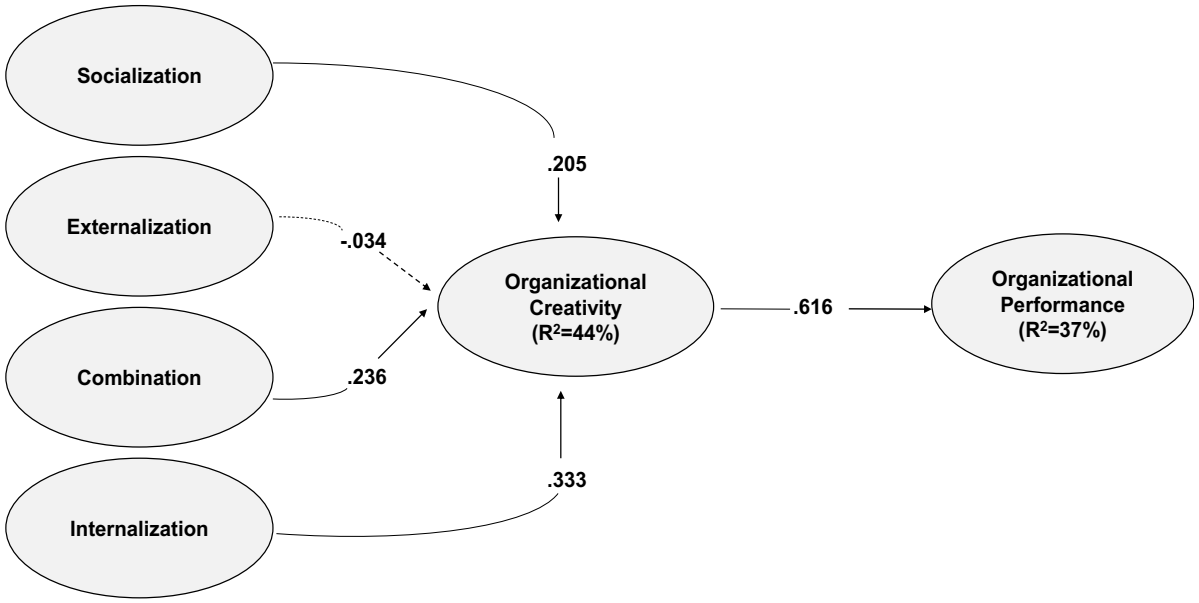

Figure 2. PLS Model Without Mediation[2]

5.2 Mediating Effect of Organizational Agility

In our extended model, we argue that organizational agility actually mediates the relationship between knowledge-creation processes and organizational creativity (H3). In order to test this hypothesis, we followed Baron and Kenny's (1986) procedure to examine organizational agility's mediating effect, which includes four steps.

First, we established the significance of the no-mediation model (see Section 5.1 above)). Next, we verified that knowledge-creation processes positively predicted organizational agility, the hypothesized mediator. Third, we established that organizational agility, the hypothesized mediator, significantly affected organizational creativity. We show the results for these two steps in Figure 3 (the "full mediation" model). Paths from all knowledge-creation processes except for externalization to organizational agility were significant. Again, only externalization did not significantly predict organizational agility. Fourth, we verified that, when we accounted for the mediator's direct effects, the overall effect of the no-mediation model either decreased or became non-significant. To do so, we compared Figures 2 and 3. When we examined the size and significance of structural paths, the three significant paths from knowledge-creation processes to organizational creativity in the base model (see Figure 2) became non-significant when we added organizational agility to the model as a mediator (see Figure 3).

In other words, organizational agility fully mediated the effect that socialization, combination, and internalization had on organizational creativity. Compared to the benchmark model, the full mediation model in Figure 3 explained significantly more variance in organizational creativity. The R^2 value increased from 44 percent to 64 percent, which represents a large effect size of .376 at the structural level (Cohen, 1988). These results suggest that the mediation model more powerfully explains organizational creativity than the base model does. Thus, we found support for H3.

[2] Solid lines represent significant relationships at the 0.05 level. Dotted lines represent non-significant relationships. Numeric values on the paths represent the path coefficients.

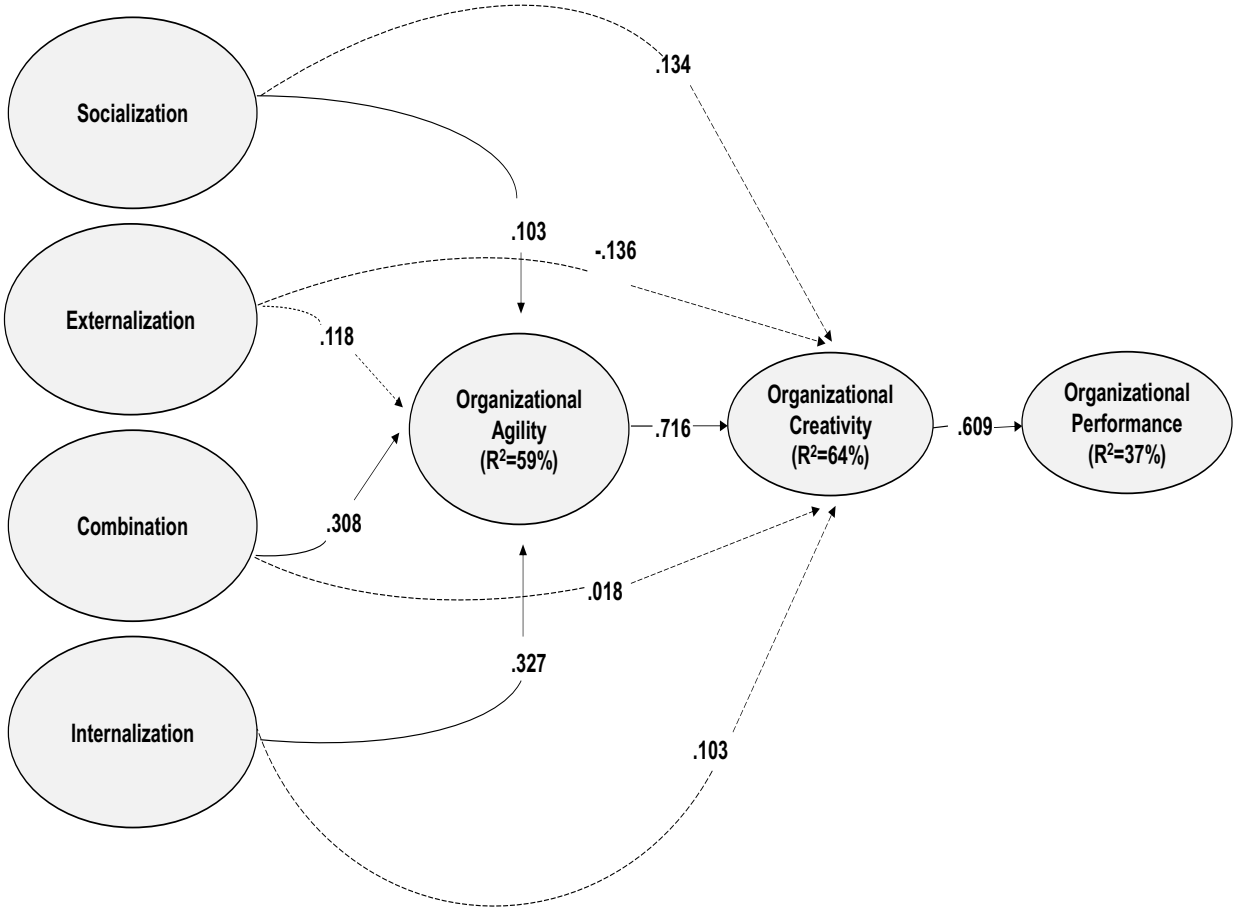

Figure 3. PLS Model with Mediation (Organizational Agility)[3]

5.3 Moderating Effect of Knowledge Characteristics

In our extended model, we also examine the extent to which organization knowledge's characteristics moderate the mediated effects that knowledge-creation processes have on organizational creativity knowledge. In other words, we investigate whether the mediating effect that we report in Section 5.2 depends on the knowledge's tacitness or institutionalization. To test these moderated mediation effects, we followed Muller, Judd, and Yzerbyt's (2005) guidelines to estimate three equations using multiple regression after normalizing knowledge tacitness (mean = .0012, S.D. = 1.0069) and knowledge institutionalization (mean = .0036, S.D. = .5507). As Table 1 shows, a Pearson's correlation between knowledge tacitness and institutionalization was not statistically significant (r = 0.19, p = n.s.), which eliminated concerns about multicollinearity between the two moderating variables. Furthermore, we tested whether the data met the assumption of collinearity and found that multicollinearity did not pose a concern since none of the variables demonstrated VIF values greater than 3.

With Muller et al.'s (2005) guidelines, we could determine whether the observed pattern indicated moderated mediation as opposed to mediated moderation, a concept that theoretically differs from but mathematically resembles moderated mediation. Equation 1 assesses the moderation of the overall treatment effect where Y is organizational creativity, X is one of the knowledge-creation processes, and Mo is one of the knowledge characteristics as a moderator.

$$Y = \beta_{10} + \beta_{11} X + \beta_{12} Mo + \beta_{13} XMo + \varepsilon_1 \quad (1)$$

[3] Solid lines represent relationships that were significant at the 0.05 level. Dotted lines represent non-significant relationships. Numeric values on the paths represent the path coefficients.

Equation 2 assesses the effect that *X* has on the mediator *Me* (i.e., organizational agility) and allows *Mo* to moderate this effect.

$$Me = \beta_{20} + \beta_{21}\ X + \beta_{22}\ Mo + \beta_{23}\ XMo + \varepsilon_2 \quad (2)$$

Equation 3 assesses both the mediator *Me*'s partial effect on *Y* and the residual effect of *X* on *Y* while controlling for the effect of *Me*. This equation allows *Mo* to moderate both effects.

$$Y = \beta_{30} + \beta_{31}\ X + \beta_{32}\ Mo + \beta_{33}\ XMo + \beta_{34}\ Me + \beta_{35}\ MeMo + \varepsilon_1 \quad (3)$$

To establish moderated mediation, *X* should have an overall effect (i.e., $\beta_{11} \neq 0$), and no overall moderating effect should exist (i.e., $\beta_{13} = 0$). Next, either the effect that *X* has on the mediator is moderated, or the effect that the mediator has on *Y* is moderated. In the first case, both β_{23} and β_{34} should be significant. In the latter case, both β_{21} and β_{35} should be significant. Although the residual effect that *X* has on *Y* should now be moderated (i.e., $\beta_{33} \neq 0$), it is not a necessary condition to establish moderated mediation (Muller et al. 2005).

Tables 3-5 summarize results from multiple least squares regression analyses of these three equations with socialization, combination, and internalization for knowledge creation as the predictor *X*, respectively. Since externalization demonstrated no overall or mediated effects on organizational creativity, we excluded it from these analyses.

Table 3 shows that knowledge tacitness moderated the mediation effect of organizational agility on the impact of socialization on organizational creativity. Specifically, Equation 1 shows that socialization had an overall significant effect on organizational creativity (b_{11} = .658, t = 6.863, p < .01) but that knowledge tacitness did not moderate that effect (b_{13} = -0.068, t = -0.88, p = .381). Next, Equation 2 shows that knowledge tacitness significantly moderated the effect that socialization had on the mediator organizational agility (b_{23} = -.151, t = -2.303, p < .01). The negative sign of the coefficient suggests that socialization had a lower effect on organizational agility for organizations with more tacit knowledge. Organizational agility, the mediator, continued to affect organizational creativity (b_{34} = .795, t = 10.169, p < .01), although knowledge tacitness did not moderate this relationship after we controlled for socialization's effect (b_{35} = .017, t = .237, p = .813). As such, we found support for H4 with respect to socialization and for moderated mediation rather than mediated moderation. We visually depict these findings in Figure 4.

Table 3. Least Squares Regression Results for Socialization as the Predictor

	Equation 1		**Equation 2**		**Equation 3**	
	(Y: org creativity)		(Y: org agility)		(Y: org creativity)	
Mo	KT	KI	KT	KI	KT	KI
Predictors	b (t)	b (t)	b (t)	b (t)	b (t)	b (t)
Soc	.658 (6.863**)	.624 (7.491**)	.609 (7.516**)	.626 (8.611**)	.178 (1.997*)	.143 (1.824)
Mo	.353 (.930)	1.503 (2.166*)	.705 (2.197**)	.563 (.931)	-.244 (-.756)	1.100 (2.106*)
Soc * Mo	-0.068 (-0.88)	-.268 (-1.919)	-.151 (-2.303**)	-.087 (-.716)	.044 (.641)	-.130 (-.865)
Me					.795 (10.169**)	.769 (10.220**)
Me * Mo					.017 (.237)	-.083 (.512)

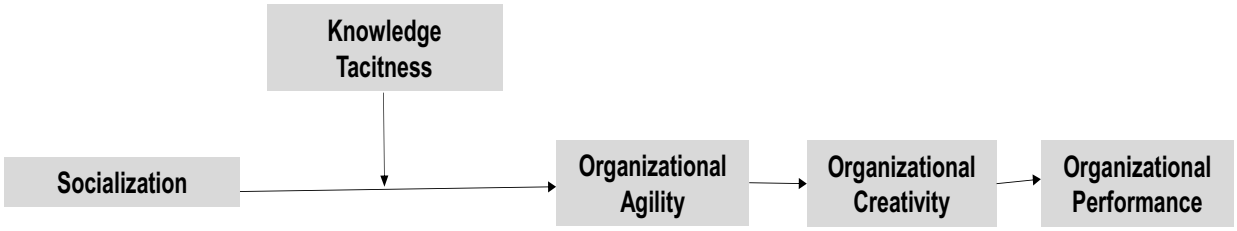

Figure 4. Moderated Mediation

Table 4 shows that knowledge institutionalization (KI) moderated the overall effect that knowledge combination had on organizational creativity (b_{13} = -.209, t = -1.994, p < .05). The negative sign of this coefficient suggests that knowledge combination had a higher effect on creativity for organizations with less institutionalized knowledge. However, this moderated relationship cannot be accounted for when we included organizational agility as a mediator because we found no evidence for prototypical mediated moderation according to Muller et al.'s (2005) guidelines. At the same time, knowledge tacitness or institutionalization did not moderate the mediation effect that combination had on organizational creativity because the path coefficients lacked statistical significance at .019 (t = .262) and -.173 (t = -1.427), respectively. In other words, we found no evidence for moderated mediation effects that would support H5.

To summarize, knowledge institutionalization moderated the overall effect that knowledge combination had on organizational creativity. Organizational agility also mediated the same effect. However, the mediation process was not moderated, nor was the moderation process mediated. We visually depict these findings in Figure 5.

Table 4. Least Squares Regression Results for Combination as the Predictor

	Equation 1		Equation 2		Equation 3	
	(Y: org creativity)		(Y: org agility)		(Y: org creativity)	
Mo	KT	KI	KT	KI	KT	KI
Predictors	b (t)	b (t)	b (t)	b (t)	b (t)	b (t)
Comb	.494 (7.024**)	.495 (8.177**)	.531 (9.478**)	.536 (11.037**)	.056 (.809)	.057 (.867)
Mo	.213 (.916)	1.195 (2.538*)	.213 (1.150)	.835 (2.212*)	-.019 (-.067)	.844 (1.965*)
Comb * Mo	-.052 (-.904)	-.209 (-1.994*)	-.054 (-1.198)	-.141 (-1.684)	-.015 (-.277)	.011 (.099)
Me					.825 (9.824**)	.804 (9.489**)
Me * Mo					.019 (.262)	-.173 (-1.427)

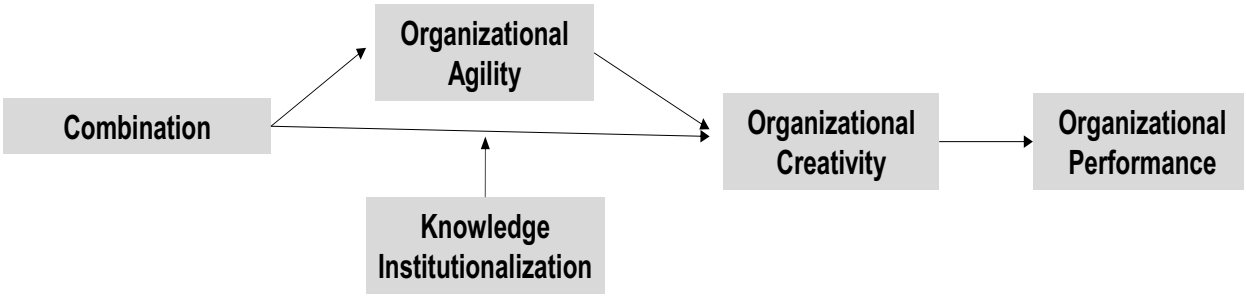

Figure 5. Moderation and Mediation

Similarly, Table 5 shows that knowledge tacitness had no moderating effect but knowledge institutionalization moderated the overall effect that internalization had on organizational creativity (b_{13} = -.233, t = -1.968, p = .05). The negative sign of this coefficient suggests a stronger moderating effect for organizations with less institutionalized knowledge. However, we could not account for this moderated relationship when we included the organizational learning as a mediator because we found no evidence for prototypical mediated moderation according to Muller et al.'s (2005) guidelines. At the same time, knowledge tacitness or institutionalization did not moderate the mediated effect that internalization had on organizational creativity because the path coefficients lacked significance at .033 (t = .407) and -.005 (t = -.054), respectively. In other words, we found no evidence for moderated mediation effects that would support H4.

To summarize, the institutionalization of an organization's knowledge moderated the overall effect that internalization had on organizational creativity. Organizational agility mediated the same effect. However, the mediated process was not moderated, nor was the moderated process mediated. We visually depict these findings in Figure 6.

Table 5. Least Squares Regression Results for Internalization as the Predictor

	Equation 1		Equation 2		Equation 3	
	(Y: org creativity)		(Y: org agility)		(Y: org creativity)	
Mo	KT	KI	KT	KI	KT	KI
Predictors	b (t)	b (t)	b (t)	b (t)	b (t)	b (t)
Int	.616 (7.327*)	.594 (8.643**)	.603 (8.737**)	0.619 (10.782**)	0.149 (1.810)	.114 (1.550)
Mo	-0.050 (-.141)	1.363 (2.384*)	0.059 (.200)	-0.179 (-.375)	-0.147 (-.484)	1.510 (3.238**)
Int * Mo	0.007 (.101)	-0.233 (-1.968*)	-0.023 (-.361)	0.080 (.816)	0.003 (.040)	-0.292 (-2.515*)
Me					0.773 (9.270**)	0.776 (9.529**)
Me * Mo					0.033 (.407)	-0.005 (-.054)

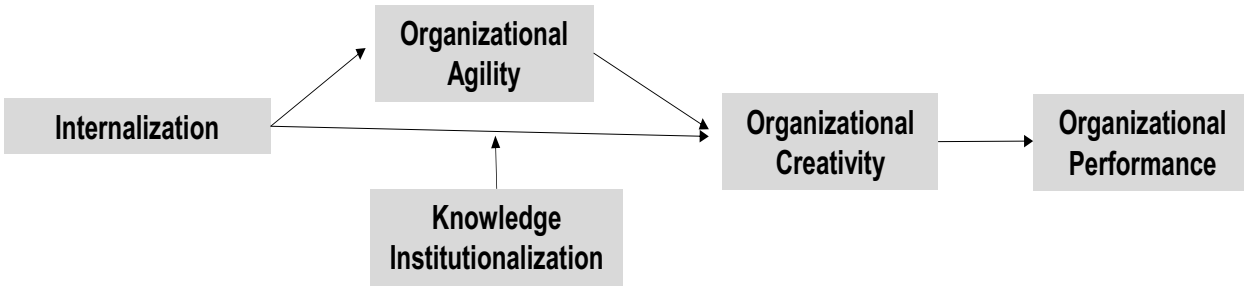

Figure 6. Moderation and Mediation

6 Discussion and Conclusion

Even though organizational creativity has received much attention in the management literature over the last decade, little research has empirically established its antecedents and consequences. Based on critically synthesizing the literature on organizational creativity, knowledge creation, and organizational agility, we thoroughly investigate the effect that knowledge-creation processes have on organizational creativity and organizational agility's mediating role in the process. Consistent with prior research, our study shows that knowledge-creation processes improve organizational creativity, which results in superior organizational performance.

The agility perspective complements the more prominent approach to organizational creativity, which focuses more heavily on psychological antecedents to creativity (Amabile, 1997; Amabile et al., 1996; Woodman et al., 1993). Existing theories tend to emphasize the significance of factors such as leadership, organizational structure, and resources in promoting creativity. In contrast, we show that, in order for an organization to be creative, it may be just as important, if not more so, to maintain an environment that fosters knowledge creation among employees. Particularly, our data suggests that knowledge-creation processes such as socialization, combination, and internalization improve organizational creativity because they allow an organization to be more agile. When knowledge-creation processes afford an organization the freedom to experiment with new ideas and take risks, the enriched knowledge environment can significantly facilitate the organization to be more creative.

At the same time, our findings that knowledge characteristics moderate the relationship between knowledge-creation processes and organizational creativity contribute to the literature by defining the "fit" between knowledge-creation processes and firm characteristics. Consistent with Birkinshaw, Nobel, and Ridderstrale (2002), we found knowledge characteristics to represent an important contingency variable. Particularly, we found that organizations that mostly rely on explicit knowledge exhibited a higher level of organizational agility from socialization, which resulted in higher levels of creativity, and they did so to a greater extent than organizations that primarily relied on tacit knowledge.

In other words, when one can capture an organization's critical knowledge in documents, routines, standard operating procedures, and technology, socialization processes create a more pronounced learning effect and, hence, result in higher creativity and better performance. Firms with primarily tacit critical knowledge possibly rely on socialization as their primary knowledge-management mechanism. Therefore, additional socialization processes produce little impact on existing organizational agility, which, in turn, leads to a minimal effect on organizational creativity or firm performance.

In contrast, we found that the degree of knowledge institutionalization moderated the direct effects that combination and internalization had on organizational creativity. Combination and internalization processes can lead to higher organizational creativity for organizations with less institutionalized knowledge, which suggests that organizations whose critical knowledge resides mostly in individual employees can benefit more when workers combine and internalize explicit knowledge. Combining explicit knowledge into new forms of knowledge promotes organizational creativity, an effect that increases in organizations that contain less documented critical knowledge at the organizational level.

As for why less institutionalized knowledge has a stronger impact on an organization's creativity, one possible reason is that creativity, even at the organizational level, derives from factors at the individual level (Amabile, 1997). Expertise, creative thinking skills, and work motivation constitute human resources that an organization requires to be creative. In particular, internalization enables individuals to develop these resources by absorbing and digesting existing documents, procedures, or routines. Since most core knowledge comes from individuals, they may have a higher motivation to learn from participating in knowledge-creation processes, which would lead to a higher level of overall organizational creativity.

Surprisingly, we did not find that externalization had an effect on enhancing organizational creativity or organizational agility as Lee and Choi (2003) report. One possible explanation is that externalization, or the process to explicitly document knowledge that otherwise remains accessible only to the knowledge owner, produces high-quality and effective documentation only if firms invest significant resources into managing the process (Markus, 2001). Externalized knowledge becomes useful often after it goes through a carefully designed refinement process (Cho, Chung, King, & Schunn, 2008; Zack, 1999b). Future studies that examine the impact that externalization has on organizational creativity or organizational agility should consider the extent of quality-refinement mechanisms. Nevertheless, this inconsistency between our finding and prior research indicates a need for future research in the area. Compared to other processes, externalization has received relatively little attention in the research community (Nonaka, 1994). Given the potential amount of learning that can be achieve through knowledge articulation and codification (Zollo & Winter, 2002), our research suggests that externalization is a complex process whose impact deserves additional research.

Our findings have significant implications for organizational creativity and knowledge-management research. However, one should consider them with the following limitations in mind. First, we administered our survey in a cross-sectional fashion, which compromises our ability to make causal inferences. A longitudinal design would strengthen the validity of conclusions about causal relationships among the variables. Second, we included only firms in Taiwan in the survey. Thus, one should take caution when generalizing our results to firms in other countries or cultures. We do, however, believe that the data collected in Taiwan adequately assess Nonaka's (1994) theory since Taiwan and Japan have much in common in terms of national culture (Hofstede, 1980). Validation against an established base model also shows consistency with findings from existing literature. Finally, the single-respondent design of our study raises concerns about common method bias. Although we did our best to ensure data validity and the exploratory and confirmatory factor analyses indicated that our data contained multiple factors (Podsakoff et al., 2003), obtaining additional sources of data in future research would further strengthen our findings' validity.

By following statistical procedures appropriate for distinguishing moderated mediation from mediated moderation, our analyses reveal interesting findings that, while knowledge tacitness moderates the *indirect* effect that socialization has on organizational creativity via organizational agility, knowledge institutionalization moderates the *direct* effects that combination and internalization have on organizational creativity. Although organizational agility mediates the effect that combination and internalization have on organizational creativity, knowledge institutionalization does not moderate these indirect mediation effects. In other words, knowledge tacitness alters the degree to which socialization impacts organizational agility, whereas knowledge institutionalization alters the extent to which combination and internalization affects organizational creativity. These results suggest that tacitness and institutionalization, although both serve

as moderators, impact the link between knowledge creation and organizational creativity in fundamentally different ways. Future research should explore theoretical explanations for this empirical discovery.

6.1 Managerial Implications

Our research suggests that managers searching for strategies to improve organizational creativity could focus on implementing knowledge-creation processes. Of course, we do not mean to suggest that firms should stop forming strategic alliances or partnerships to access knowledge and expertise resources that external firms can create more effectively and efficiently. Nor do we imply that other modes of knowledge acquisition such as grafting have less importance. Rather, our research simply illustrates the potential of knowledge-creation processes in developing a more creative firm.

Further, our research also suggests that organizational agility has a crucial role in fostering organizational creativity. Specifically, it suggests that managers who intend to develop programs for enhancing organizational creativity and firm performance could focus on agility as a major success indicator. Unless knowledge-creation processes have induced organizational agility, increases in organizational creativity and firm performance are less likely to occur.

The moderating effects of knowledge tacitness and institutionalization suggest that managers in different organizations should examine the nature of their organizational knowledge before they implement knowledge-creation processes. For organizations that have primarily explicit knowledge (such as manufacturing firms), socialization activities that encourage employees to share their tacit knowledge through collaboration, apprenticeship, or brainstorming may boost creativity through higher organizational learning. In contrast, organizations that have primarily personal knowledge (such as design firms) may need a different strategy to develop organizational creativity. For these firms, more effective strategies would include developing explicit knowledge via combining existing explicit knowledge and encouraging employees to internalize explicit knowledge.

In the future, we expect more research on the role that organizational learning and creativity play in organizational knowledge management. Better understanding the mechanism(s) through which firms can increase organizational creativity and enhance their performance may allow managers to better capture the effects of different knowledge-creation processes and understand the key contingency factors that they must consider when implementing knowledge-management systems.

Acknowledgments

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References

Amabile, T. M. (1983). *The social psychology of creativity*. New York, NY: Springer-Verlag.

Amabile, T. M. (1997). Motivating creativity in organization: On doing what you love and loving what you do. *California Management Review*, *40*(1), 39-58.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*(5), 1154-1184.

Ambrosini, V., & Bowman, C. (2001). Tacit knowledge: Some suggestions for operationalization. *Journal of Management Studies*, *38*(6), 811-829.

Ashrafi, N., Xu, P., Sathasivam, M., Kuilboer, J., Koelher, W., Heimann, D., & Waage, F. (2005). A framework for implementing business agility through knowlegde management systems. In Proceedings of the *7th IEEE International Conference on E-Commerce Technology Workshops*.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychology research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173-1182.

Becerra-Fernandez, I., & Sabherwal, R. (2001). Organizational Knowledge Management: A Contingency Perspective. *Journal of Management Information Systems*, *18*(1), 23-55.

Bhatt, G. D. (2002). Management strategies for individual knowledge and organizational knowledge. *Journal of Knowledge Management*, *6*(1), 31-39.

Birkinshaw, J., Nobel, R., & Ridderstrale, J. (2002). Knowledge as a contingency variable: Do the characteristics of knowledge predict organizational structure? *Organization Science*, *13*(3) 274-289.

Bolton, M. K. (1993). Imitation versus innovation: Lessons to be learned from the Japanese. *Organizational Dynamics*, *21*(3), 30-45.

Cabrera, A., & Cabrera, E. F. (2002). Knowledge-sharing dilemmas. *Organization Studies*, *23*(5), 687-710.

Chin, W. W. (1998). The partial least squares approach for structural equation modelling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum.

Chin, W. W., & Marcolin, B. (1995). The holistic approach to construct validation in IS research: Examples of the interplay between theory and measurement. In *Proceedings of the Annual Conference of the Administrative Sciences Association of Canada* (pp. 33-43).

Cho, K., Chung, T. R., King, W. R., & Schunn, C. (2008). Peer-based computer-supported knowledge refinement: An empirical investigation. *Communications of the ACM*, *51*(3), 83-88.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, W. M., & Levinthal, D. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128-152.

Conner, K. R., & Prahalad, C. K. (1996). A resource-based theory of the firm: knowledge versus opportunism. *Organization Science*, *7*(5), 477-501.

D'Aveni, R. A. (1994). *Hypercompetition: Managing the dynamics of strategic maneuvering*. New York, NY: The Free Press.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, *34*(3), 555-590.

Damanpour, F., & Evan, W. M. (1984). Organizational innovation and performance: The problem of organizational lag. *Administrative Science Quarterly*, *29*(3), 392-410.

Davenport, T. H., & Prusak, L. (2000). *Working knowledge*. Cambridge, MA: Harvard Business School Press

DeCarolis, D. M., & Deeds, D.L. (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.

Delaney, J. T., & Huselid, M. A. (1996). The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal*, *39*(4), 949-969.

Dess, G. G., & Robinson, R. B. J. (1984). Measuring organizational performance in the absence of objective measure: The case of the privately-held firm and conglomerate business unit. *Strategic Management Journal*, *5*(3), 265-273.

Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science*, *32*(11), 1422-1433.

Donnelan, B., & Kelly, A. (2005). Agility and information technology diffusion in the semiconductor industry. In R. L. Baskerville, L. Mathiassen, J. Pries-Heje, & J. I. DeGross (Eds.), *Business agility and information technology diffusion.* New York, NY: Springer.

Drazin, R., Glynn, M. A., & Kazanjian, R. K. (1999). Multilevel theorizing about creativity in organizations: a sensemaking perspective. *Academy of Management Review*, *24*(2), 286-307.

Efron, B., & Tibshirani, R. J. (1993). *An introduction to the bootstrap*. New York, NY: Chapman and Hall.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, *21*(10/11), 1105-1121.

Florida, R. (2002). *The rise of the creative class*. New York, NY: Basic Books.

Ford, C. M. (1996). A theory of individual creative action in multiple social domains. *Academy of Management Review*, *21*(4), 1112-1142.

Glynn, M. A. (1996). Innovative genius: A framework for relating individual and organizational intelligences to innovation. *Academy of Management Review*, *21*(4), 1081-1111.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, *18*(1), 185-214.

Gongla, P., & Rizzuto, C. R. (2001). Evolving communities of practice: IBM global services experience. *IBM Systems Journal*, *40*(4), 842-862.

Grant, R. M. (1991). The resource-based theory of competitive advantage: Implications for strategic management formulation. *California Management Review*, *33*(1), 114-135.

Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization Science*, *7*(4), 375-387.

Haas, M. R., & Hansen, M. (2005). When using knowledge can hurt performance: The value of organizational capabilities in a management consulting company. *Strategic Management Journal*, *26*(1), 1-24.

Hansen, M. T., Nohria, N., & Tierney, T. (1999). What's your strategy for managing knowledge? *Harvard Business Review*, *77*(2), 106-116.

Hargadon, A., & Sutton, R. I. (1997). Technology brokering and innovation in a product development team. *Administrative Science Quarterly*, *42*(4), 716-749.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Newbury Park, CA: Sage.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four studies. *Strategic Management Journal*, *20*(2), 195-204.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: An integration and empirical examination. *Journal of Marketing*, *62*(3), 42-54.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383-397.

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.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, *13*(S1), 111-125.

Leonard-Barton, D. (1995). *Wellsprings of knowledge: Building and sustaining the source of innovation*. Boston, MA: Harvard Business School Press.

March, J. G., & Simon, H. A. (1958). *Organizations*. New York: Wiley.

Markus, M. L. (2001). Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems*, *18*(1), 57-93.

Marwick, A. D. (2001). Knowledge management technology. *IBM Systems Journal*, *40*(4), 814-830.

Menon, A., Bharadwaj, S. G., Adidam, P. T., & Edison, S. W. (1999). Antecedents and consequences of marketing strategy making: A model and a test. *Journal of Marketing*, *63*(2), 18-40.

Moran, P., & Ghoshal, S. (1996). Value creation by firms. In *Academy of Management Best Paper Proceedings* (pp. 41-45).

Moqbel, M., & Nah, F. F. H. (2017). Enterprise social media use and impact on performance: The role of workplace integration and positive emotions. *AIS Transactions on Human-Computer Interaction*, *9*(4), 261-280.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, *89*(6), 852-863.

Nadkarni, S., & Narayanan, V. K. (2007). Strategic schemas, strategic flexibility, and firm performance: The moderating role of industry clockspeed. *Strategic Management Journal*, *28*(3) 243-270.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, *23*(2), 242-266.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, *5*(1), 14-37.

Nonaka, I., Byosiere, P., Borucki, C. C., & Konno, N. (1994). Organizational knowledge creation theory: A first comprehensive test. *International Business Review*, *3*(4), 337-351.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company: How Japanese companies create the dynamics of innovation*. New York, NY: Oxford University Press.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York, NY: McGraw-Hill.

Overby, E., Bharadwaj, A., & Sambamurthy, V. (2005). A framework for enterprise agility and the enabling role of digital Options. In R. L. Baskerville, L. Mathiassen, J. Pries-Heje, J. I. DeGross (Eds.), *Business agility and information technology diffusion.* Boston, MA: Springer.

Parent, M., Gallupe, R. B., Salisbury, W. D., & Handelman, J. M. (2000). Knowledge creation in focus group: Can group technologies help? *Information & Management*, *38*(1), 47-58.

Podsakoff, N. P., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531-544.

Podsakoff, P. M., MacKenzie, S. B., Lee, J., & Podsakoff, N. P. (2003). Common method bias in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903.

Polanyi, M. (1966). *The tacit dimension*. London, UK: Routledge.

Ross, P. F. (1974). Innovation adoption by organizations. *Personnel Psychology*, *27*(1), 21-47.

Sabherwal, R., & Becerra-Fernandez, I. (2003). An empirical study of the effect of knowledge management processes at the individual, group, and organizational levels. *Decision Sciences*, *34*(2), 225-260.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly*, *27*(2), 237-263.

Sambamurthy, V., Wei, K.-K., Lim, K., & Lee, D. (2007). IT-enabled organizational agility and firms' sustainable competitive advantage. In *Proceedings of the International Conference on Information Systems.*

Shapira, Z. (1995). *Risk taking: A managerial perspective*. New York, NY: Russel Sage Foundation.

Smith, K. G., Collins, C. J., & Clark, K. D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal*, *48*(2), 346-357.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, *17*(S2), 45-62.

Sprague, R. H. J. (1995). Electronic document management: challenges and opportunities for information systems managers. *MIS Quarterly*, *19*(1), 29-49.

Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems*, 13, 380-427.

Subramanian, A., & Nilakanta, S. (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega*, *24*(6), 631-647.

Swanson, E. B., & Culnan, M. J. (1978). Document-based systems for management planning and control: A classification, survey, and assessment. *MIS Quarterly*, *2*(4), 31-47.

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS Quarterly*, *29*(2), 311-334.

Venkatraman, N., & Ramanujan, V. (1987). Measurement of business economic performance: An examination of method convergence. *Journal of Management, 13*(1), 109-122.

Wade, M., & Hulland, J. (2004). The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, *28*(1), 107-142.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171-180.

Woodman, R., Sawyer, J., & Griffin, R. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*(2), 293-321.

Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal*, *39*(4), 836-866.

Zack, M. H. (1999a). Developing a knowledge strategy. *California Management Review*, *41*(3), 125-145.

Zack, M. H. (1999b). Managing codified knowledge. *Sloan Management Review*, *40*(4), 45-58.

Zander, U., & Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities—an empirical test. *Organization Science*, *6*(1), 76-92.

Zhang, X., & Venkatesh, V. (2017). A nomological network of knowledge management system use: Antecedents and consequences. *MIS Quarterly*, *41*(4), 1275-1306.

Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, *13*(3), 339-351.

Appendix A: Survey Measures

Here, we list the measures we used in the survey study. The questions used a seven-point Likert scale that ranged from strongly disagree to strongly agree.

Please respond to the following questions by assessing the nature of your organization's knowledge.

Knowledge tacitness

1) Most of the important knowledge your organization manages can be expressed clearly in words and language. (Reverse-scored.)
2) Most of the important knowledge your organization manages can be obtained in documents and manuals. (Reverse-scored.)
3) Most of the important knowledge your organization manages is intuitive or creative, or must be achieved with special skills.
4) Most of the important knowledge your organization manages is hands-on experience, and must be carried out physically, and accumulated through constant trial and error.
5) Most of the important knowledge your organization manages depends on individual employees' personal knowledge.

Knowledge institutionalization

1) Most of the important knowledge your organization manages is critically impacted when key employees leave. (Reverse-scored.)
2) Special skills, equipment, and patents managed by your company are extremely important to the business operations.
3) Most of the important knowledge your organization manages follows standard operating procedures. The role of collaboration, coordination and specialization among individual employees in business operations is minimal.

Socialization

1) In your organization, senior employees often share their work experiences with new members.
2) In your organization, employees often discuss and share specialized knowledge in a particular domain.
3) In your organization, when employees experience difficulty at work, they often discuss the issues with appropriate coworkers, and seek optimal solutions collaboratively.
4) In your organization, employees are routinely rotated through various job positions.
5) In your organization, collaboration across functional divisions is common.
6) In your organization, problems are often solved through brainstorming sessions.

Externalization

1) In your organization, employees often write up personal experiences into systematic documents for coworkers' reference.
2) In your organization, when problems are solved, employees often document relevant knowledge into systematic files for coworkers' reference.
3) In your organization, commonly experienced problems are often solved by standard solutions.
4) In your organization, computer-based information systems are often used to support discussions among employees.
5) In your organization, prior experience, either success or failures, is often documented for future reference.
6) All meetings are documented fully in meeting notes.

Combination

1) In your organization, employees often search for relevant information using computer databases or knowledge repositories in order to solve work-related problems.
2) In your organization, employees often share their experience and insights with coworkers through the Internet or Intranet.
3) Important strategic decisions are often made after referencing research reports or consulting computer simulation results.
4) In your organization, it is common to improve work quality by organizing, synthesizing, updating and purifying existing knowledge.
5) In your organization, knowledge about products and services are usually codified into computer databases for employees' reference and education.
6) In your organization, knowledge about products and services are usually codified into manuals and documents for employees' reference and education.

Internalization

1) In your organization, employees often read documents and other written materials in order to complete their work.
2) In your organization, employees often learn necessary and relevant skills through hands-on practices.
3) Your organization often provides employee training.
4) Your organization often brings in new knowledge to facilitate employee development by hiring consultants or collaborating with other firms.
5) Your organization encourages employees to obtain continuous education.
6) Your organization encourages employees to utilize e-learning systems in problem solving.

Organizational agility

Over the past two years, your organization has improved its ability to:

1) Identify new business opportunities.
2) Coordinate the development efforts of different units.
3) Anticipate potential market opportunities for new products/services.
4) Adapt quickly to unanticipated changes.
5) Anticipate surprises and crises.
6) Quickly adapt its goals and objectives to industry/market changes.
7) Decrease market response times.
8) React to new information about the industry or market.
9) Be responsive to new market demands.
10) Avoid overlapping development of corporate initiatives.
11) Streamline its internal processes.
12) Reduce redundancy of information and technology.

Organizational creativity

Your company:

1) Has produced many novel and useful ideas (services/products).
2) Spends much time for producing novel and useful ideas (services/products).
3) Fosters an environment that is conductive to your own ability to produce novel and useful ideas (services/products).
4) Considers producing novel and useful ideas (services/products) as important activities.
5) Actively produces novel and useful ideas (services/products).

Organizational performance

Over the past two years, your organization has demonstrated:

1) Higher profitability than competitors.
2) Higher sales growth than competitors.
3) Higher customer satisfaction than competitors.
4) Higher employee productivity than competitors.
5) A greater market share than competitors.
6) Superior product quality or service quality than competitors.
7) More innovativeness than competitors.
8) Stronger development of new products, services, or programs than competitors.

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