Knowledge Creation and Organizational Performance:
Moderating and Mediating Processes from an Organizational
Agility Perspective

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Abstract

Knowledge management systems (KMS) are critical technology-based platforms that support the creation of knowledge and improve organizational creativity to help sustain a firm’s competitive advantage. However, 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, are not clear. We examine the role of organizational agility as a mediator between knowledge creation and organizational creativity, and the subsequent effect of creativity on organizational performance. The moderating roles of two key knowledge characteristics, tacitness and institutionalization, in the mediation processes are also analyzed. Our results indicate that organizational agility mediates the effect of knowledge creation on organizational creativity. Moreover, knowledge tacitness moderates the effect of socialization on organizational creativity. Knowledge institutionalization, on the other hand, moderates the effects of combination and internalization on organizational creativity. Our findings extend prior research by providing insights into the role of knowledge creation and knowledge characteristics in stimulating organizational creativity and firm performance. Implications for practitioners and researchers are discussed.

Keywords: Knowledge Management, Knowledge Creation, Organizational Creativity, Organizational Performance, Organizational Agility, Moderated Mediation.
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 and Narayana 2007). Knowledge management systems (KMS), which are information system platforms to support organizational knowledge management, have rapidly become ubiquitous as firms seek new ways to increase productivity, performance, and agility (Moqbel and Nah 2017; Zhang and Venkatesh 2017). Many organizations have implemented KMS to codify knowledge contained within the organization to build and exploit their competitive advantages (Marwick 2001). As such, KMS are important platforms that allow employees to store, share, locate, retrieve and utilize 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 and Prusak 2000). Turning their knowledge stock into profitable resource thus represents a crucial issue facing modern organizations. The domain of knowledge management often constitutes a crucial responsibility of information systems (IS) managers and executives (Sprague 1995; Swanson and 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 is not only determined by tangible assets, but also dependent on the organization’s capabilities to create and utilize knowledge (Moqbel and Nah 2017; Zhang and Venkatesh 2017). This view suggests that the mechanism by which knowledge is converted into capabilities and competitive advantages is a fundamental research question for KM scholars. Previous literature has indicated that simply maintaining existing knowledge to implement known practices and produce predictable results, is insufficient in the dynamic, high-velocity markets (Eisenhardt and Martin 2000). Firms must constantly generate novel and useful ideas in order to attain and sustain their competitive advantage over time (Parent et al. 2000).

The strategic value of knowledge management has been demonstrated in a number of empirical studies on knowledge creation, organizational creativity and organizational performance. 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? What is the underlying mechanism for knowledge creation processes to enhance organizational creativity, and ultimately organizational performance? Despite the relevance, the theoretical relationship between knowledge management capabilities and organizational agility has rarely been specified formally (see Ashrafi et al. 2005 for an exception). There is also a paucity of empirical support for the role of knowledge management, in particular knowledge creation, and organizational agility in enhancing firm performance.
We build a model that extends the growing stream of work on organizational creativity and performance (Amabile 1983; Drazin et al. 1999; Ford 1996; Woodman et al. 1993) by incorporating the role of 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 is firmly based on 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, not only do they improve existing processes, but dynamic capabilities also develop to integrate knowledge into creative ideas, novel solutions, and new products and services (Eisenhardt and Martin 2000; Hargadon and Sutton 1997).

A related goal of this research is to examine whether the effect of knowledge creation processes on organizational learning is contingent 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, our goal is to 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 the mediation of improved organizational agility. Organizational creativity, in turn, positively impacts firm performance. Our model also indicates that the mediating process is contingent upon the characteristics of the knowledge (i.e., tacitness and institutionalization).

The remainder of the paper begins with a critical synthesis of existing literature on the role of knowledge creation processes as a competitive capability. Next we review Lee and Choi’s (2003) model of knowledge creation, creativity, and firm performance. Based on this discussion, we then develop a theoretical model which includes the mediating role of organizational agility, and
moderating factors that facilitate organizational creativity and organizational performance. The conceptual model is then tested in an empirical study. Finally, implications for knowledge management researchers and practitioners who review and consider KMS adoption in organizations are discussed.

**Theoretical Background**

**Knowledge Creation as a Competitive Capability**

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

Knowledge that is publicly available to all firms or commonly shared among industry players rarely meets these criteria. Internally created knowledge is more likely to lead to innovation than knowledge acquired through imitation (Bolton 1993). Conner and Prahalad (1996), therefore, argue that only privately held knowledge becomes a valuable asset for competitive advantage. Much organizational knowledge is in fact gained as a result of borrowing, as opposed to original and creative invention (March and Simon 1958). When knowledge is acquired or transferred from external sources, however, it is unlikely to be rare enough to create differences substantial enough to give the firm a competitive edge, unless it is combined with unique knowledge generated within the firm (Zack 1999a).
In contrast, knowledge that is created internally within the firm has a higher probability of becoming a valuable resource because it is much more difficult for competitors to access and then imitate (Zack 1999a). As demonstrated by Leonard-Barton (1992), 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 organizational activities promoting knowledge creation can be conceptualized as an important knowledge management capability for establishing knowledge asymmetry, converting resources into performance, and resulting in competitive advantages (Tanriverdi 2005).

**Knowledge Creation Processes**

Knowledge creation is defined as the capability of forming new knowledge as a result of processing information and knowledge already present in the organization (Nonaka 1994; Nonaka et al. 1994). This capability is enabled by KMS processes through which knowledge can be created from the conversion between tacit and 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 and Ghoshal 1996; Nahapiet and Ghoshal 1998), refers to the process of converting tacit knowledge into new forms of tacit knowledge through human interactions. Since tacit knowledge is possessed by individuals and cannot be easily codified, the sharing and exchange of tacit knowledge usually occurs 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 illustrates an example of the socialization process where tacit knowledge is exchanged and created among senior and junior engineers (Sabherwal and Becerra-Fernandez 2003). Similarly, communities of practice at IBM generate new ideas, products and practices through socialization as they mature (Gongla and Rizzuto 2001).

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

In contrast, combination and internalization are methods of creating new knowledge out of existing explicit knowledge. Combination is the process of creating new explicit knowledge by organizing, synthesizing, updating, and purifying existing knowledge that is also explicit. For example, a firm can create comprehensive customer profiles by combining existing customer reports from different departments. Other researchers have also argued that combination is one of the two main processes through which all new resources, including knowledge, are created (Moran and Ghoshal 1996; Nahapiet and Ghoshal 1998). A firm’s “combinative capabilities” (Kogut and Zander 1992) by which the firm synthesizes knowledge resources and generates new applications offers an important source of dynamic capabilities (Eisenhardt and Martin 2000).

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

**Knowledge Creation and Organizational Performance**

For these knowledge creation processes to be considered valuable firm resources, they must be able to generate sustained performance. Conceptually, knowledge creation is not very different from Grant’s (1996) notion of knowledge integration, where complex yet productive activities among members of specialist teams allow the firm to harness and integrate new insights generated through the process of integrating diverse sources of knowledge. Grant (1996) has presented compelling arguments for why competitive advantage is the outcome of knowledge integration processes. Empirically, the current literature suggests that knowledge creation processes can indeed enhance knowledge management satisfaction (Becerra-Fernandez and Sabherwal 2001), and organizational performance (Lee and Choi 2003). Organizational knowledge created internally, such as products in the pipeline and firm citations in biotechnology firms, has been linked to positive firm performance (DeCarolis and Deeds 1999). However, a key question remains: What are the mechanisms underlying the relationship between knowledge creation processes and organizational performance?

**The Impact of Organizational Creativity: Existing Model**

One theory interprets the impact of knowledge creation capability on firm performance through the lens of organizational creativity, defined here as that the organization’s orientation towards inventiveness, adoption of new behaviors, and receptivity and openness to new ideas (Hurley and Hult 1998; Menon et al. 1999; Woodman et al. 1993). An organization with an open flow of communication, propensity for risk taking, leadership style that encourages participation, discussion and divergent thinking, and an organizational climate that discourages groupthink is
more likely to be rewarded with creative output from its employees (Amabile et al. 1996). Such creative organizations are not only more receptive to creative suggestions and ideas, it also demonstrates a stronger disposition toward the risk and uncertainty associated with adopting products of creative actions (Shapira 1995).

While knowledge creation processes facilitate the development of new knowledge, organizational creativity represents the organization’s propensity to adopt new behaviors and ideas. In other words, knowledge creation processes demonstrate an organization’s emphasis on organizational learning, whereas organizational creativity reflects the organization’s ability to recognize and absorb new ideas, and the willingness to take risks associated with implementing these ideas (Ford 1996).

Ford (1996) argues that two conditions particularly influence an organization’s ability to perform creative actions: the organization’s absorptive capacity, and the organization’s disposition toward risk. Within this framework, knowledge creation processes encourage the development of organizational creativity by enhancing a firm’s absorptive capacity and risk disposition.

First, when knowledge creation processes are implemented, they promote an explicit emphasis on learning. When organizational members are encouraged 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 the organization with greater acceptance of novel insights, promoting an organizational climate that is more conducive to taking the chance of implementing new ideas despite the potential risks of failure (Hurley and Hult 1998).

Furthermore, knowledge creation processes expand the firm’s knowledge base, which is an antecedent condition for the adoption and implementation of innovative ideas (Damanpour 1991).
When knowledge resources are plentiful, firms can more easily absorb new ideas (Cohen and Levinthal 1990). Consequently, new ideas can be understood more easily, and firms are more likely to establish procedures for the development and implementation of these ideas (Dewar and Dutton 1986). Finally, knowledge creation processes encourage communication and exchange of ideas among members of various functional departments. This higher rate of idea exchange facilitates internal communication, which in turn enhances adoption of innovative ideas and accelerates dispersion of ideas within the organization, creating a context that enhances the survival of new ideas (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. Their conceptualization of organizational creativity is consistent with ours, focusing specifically on the organization’s openness to new ideas and willingness to develop and implement innovative products or services. Indeed, when organizational members are encouraged 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. Empirically, Lee and Choi (2003) have demonstrated that the extent of the organization’s innovative culture is positively associated with all four domains of knowledge creation. The rate of new product and service introduction has also been shown to reflect an organization’s knowledge creation capabilities (Smith et al. 2005). Hence we present the following hypothesis:

**Hypothesis 1:** Knowledge creation positively enhances organizational creativity.

The impact of organizational creativity on organizational performance, defined here as the degree to which firms achieve desired goals and performance measures, such as increased
efficiency and revenue growth, relative to their industry competitors (Lee and Choi 2003), is well established in the literature. Hurley and Hult (1998) posit that organizational creativity affects a firm’s innovative capacity, which, in turn, is a critical determinant of the firm’s competitive advantage and performance. Empirical evidence supporting the linkage between the two constructs is widely available in the literature. For instance, Damanpour and Evans’s (1984) survey of 85 public libraries in the Northeastern region of the U.S. reveals that organizational innovation positively affects organizational performance. Similarly, Subramanian and Nilakanta’s (1996) survey of 141 banks in the Midwest region of the U.S, confirms this 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. These emerging findings suggest the following hypothesis:

_Hypothesis 2: Organizational creativity positively enhances organizational performance._

**An Organizational Agility View: The Proposed Model**

Knowledge creation processes not only promote a higher level of organizational creativity, they also create competitive advantage by enhancing the 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 is predicated on organizational agility. Specifically, we argue that two
knowledge characteristics, namely, tacitness and institutionalization, play important moderating roles in knowledge creation processes. These arguments are elaborated below.

**The Mediating Role of Organizational Agility**

As modern organizations adapt to hypercompetitive environments, organizational agility, or their ability to sense environmental changes and respond to them appropriately with speed and intensity (Overby et al. 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 the 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 firms to make quick decisions with a high degree of certainty, notwithstanding change and uncertainty in the environment. People and information are key differentiators in the presence of agile competition (Goldman 1995), and knowledge creation processes allow firms to maximally mobilize these intellectual resources.

New knowledge generated as a result of knowledge creation processes contributes to the firm’s digital knowledge capital, “the IT-enabled repository of knowledge and the systems of interaction among organizational members to generate knowledge sharing of expertise and perspectives” (Sambamurthy et al. 2003, p. 247). Knowledge codified through the externalization process, for example, can be digitally transmitted to a broader set of functional
units and organizational members across geographical boundaries, reaching a more diverse audience that can benefit from such knowledge. For example, semiconductor design companies implement eCatalogs and design repositories to support communication and collaboration efforts during the new product development process across the organization (Donnelan and Kelly 2005). eCatalogs and design repositories are IT applications that inventory existing design products in the semiconductor community. They provide a common platform to support various knowledge creation processes. As such, these tools create greater knowledge reach by facilitating awareness of designs that are available for reuse and visibility of internal design products in the marketplace outside the organization. Greater accessibility of the industry’s knowledge base is vital to the organization’s ability 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 and Kelly 2005, p. 266).

At the same time, insights derived from knowledge creation processes enrich the quality of the 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, again, enhancing the richness of the firm’s knowledge (Sambamurthy et al. 2003). In new product development, peer reviews are an important part of knowledge creation processes for ensuring the quality of knowledge products and justifying design decisions (Donnelan and Kelly 2005; Nonaka and Takeuchi 1995).

Greater knowledge reach and richness fostered by knowledge creation processes enable stronger organizational agility (Sambamurthy et al. 2003). Externally, enriched knowledge allows the organization to more accurately detect a relevant change in the environment (e.g., market
opportunities, or evolving customer needs), and to more quickly comprehend the meaning of such events. This enhanced speed in perception and comprehension is 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 the organization 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 the 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. “Innovation is intendedly adaptive, and it is undertaken typically in response to unfamiliar, unexpected, or non-routine problems” (Glynn 1996, p. 1095). An agile organization is nimble in both sensing problems and unexpected changes arising in the environment, and developing an appropriate response plan and executing it in a speedy manner. The agile organization’s response is often an innovation with varying degrees of track record. The ability to sense problems quickly and identify proper solutions accurately gives the organization higher degree of certainty in adopting and implementing innovative ideas. In other words, the agile organization is more capable of dealing 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 2005; Sambamurthy et al. 2003).
To summarize, we have presented a theoretical model to illustrate the mechanism underlying the impact of knowledge creation processes on firm performance. Specifically, we argue that knowledge creation processes promote organizational creativity that enhances firm performance. Moreover, this relationship is potentially mediated by organizational agility. 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. Hence, we posit the following hypothesis as the main argument of our extended model:

*Hypothesis 3: Organizational agility mediates the relationship between knowledge creation processes and organizational creativity.*

**The Moderating Role of Knowledge Characteristics**

Another important extension of the existing model is to include contingency factors. Although Nonaka’s (1994) model describes four possible forms of knowledge creation, it is conceivable that in most settings only a subset of these activities present an optimal fit with a given organization. Existing literature has not adequately investigated the contingencies under which knowledge creation processes are more valuable. The inclusion of contingency factors in our model not only increases the theory’s predictive power, but also makes the model a more useful tool for practitioners when deciding on which activities they should concentrate 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 is established along two knowledge dimensions: The epistemological dimension represents the distinction between tacit and explicit knowledge made by Polanyi (1966), 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). Systematic differences in knowledge characteristics along these two dimensions, therefore, could amplify or diminish the effects of certain knowledge creation processes. The following discussion develops a rationale for using those two knowledge characteristics, namely, tacitness and institutionalization, as contingency variables in our research model.

**Tacitness**

As defined by Polanyi (1966) and modified and elaborated subsequently by Nonaka (1994), tacitness represents the degree to which knowledge cannot be expressed 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. It cannot be easily explicated into a form that allows easy sharing and communication. Intuition and insight, for example, are forms of highly tacit knowledge. They are rooted in personal action and experience, and deeply influenced by personal values, goals, and emotions. The bread-making company described in Nonaka et al. (1995) possesses organizational knowledge that is largely tacit.

Organizational knowledge that is low on tacitness, or, in other words, that is more explicit, can be more systematically expressed with symbolic representation. Sharing and communication of
such knowledge can be accomplished via the exchange of information, documents, scientific formulas, and standard operating procedures. Explicit knowledge is less personalized, and can be more easily detached from personal values or emotions. Procedures for assembling hamburgers at a fast food restaurant, for example, are well understood and explicitly stated. Such firms that specialize in assembling well-defined products possess organizational knowledge that is largely explicit.

Because the four knowledge creation processes involve the interaction and transformation between tacit and explicit knowledge, the significance of these processes by definition depends on the tacitness of knowledge (or the lack of it) 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 new knowledge that is more explicit. At the same time, they could offer a source of creative competitiveness for firms that manage highly tacit knowledge. This is consistent with Hansen, Nohria, and Tierney’s (1999) view that knowledge management strategies should fit the organization’s needs for knowledge. They suggest that companies relying on tacit knowledge should focus on personalization strategies, whereas companies managing explicit knowledge should develop strategies that are more consistent with the codification approach. Following this line of reasoning, we posit the following hypothesis:
Hypothesis 4: The degree of tacitness of the organization’s critical knowledge moderates the effect of knowledge creation processes on organizational creativity as mediated by organizational agility.

Institutionalization

Although knowledge is usually created by individuals, individual knowledge becomes assimilated into and eventually captured within organizational structures and routines as the basis of organizational knowledge over time (Spender 1996). Organizations differ in terms of the extent to which their critical knowledge is embedded in the organization, as opposed to the individual, or the “degree of aggregation” of their knowledge (Cabrera and Cabrera 2002). Knowledge stored in structures, routines, standard operating procedures, technology, and coordination is highly institutionalized. Fast-food franchises such as pizza delivery chain stores have developed organizational knowledge that is highly institutionalized. The routines, procedures and technology to make pizzas and provide services are deeply embedded in the organization 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, knowledge possessed by individual members of the organization that is not commonly available to others is less institutionalized. Knowledge possessed by master bread makers in specialty bakeries and creative designers in fashion houses is usually highly personalized (Nonaka and Takeuchi 1995). Organizational knowledge of firms that depend on such skills is low on institutionalization. The degree of institutionalization discussed here is consistent with Spender’s (1996) personal-social dimension along which knowledge varies.

Empirically, Sabherwal et al. (2003) have established that different processes of knowledge creation lead to varying degrees of perceived knowledge management effectiveness at the
individual, group, and organizational levels. Internalization and externalization facilitates perceived effectiveness at the individual level, whereas combination enhances effectiveness at the organizational level. These findings are consistent with the theory that the impact of knowledge creation is amplified 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 the organization, the consequence of certain knowledge creation processes should be even more significant. This rationale leads to the following hypothesis:

**Hypothesis 5:** The degree of institutionalization of the organization’s critical knowledge moderates the effect of knowledge creation processes on organizational creativity as mediated by organizational agility.

The theoretical discussion thus far and the resulting hypotheses are integrally summarized in the research model illustrated in Figure 1. Operationalization of individual elements in the model and the design of an empirical study are described in the next section.

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Insert Figure 1 about Here

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**Research Design**

Since our study extends Lee and Choi’s (2003) work, we use their research model as the benchmark (shown in Hypotheses 1 and 2), and then examine whether the extended model of adding organizational learning as a mediator can better interpret the empirical data.

**Construct Operationalization**
Our theoretical model motivates the measurement of 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. The measurements of these variables are described in detail below. Actual survey items are listed in the Appendix.

**Knowledge Creation Process (predictor variable)**

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

**Organizational Creativity (predictor variable)**

Five items measuring organizational creativity were adapted from Lee and Choi (2003) who derived and validated the items from the existing literature.

**Organizational Agility (mediator)**
Twelve items measuring organizational agility were adapted from Gold et al. (2001). These items were originally designed to measure the extent to which organizations experienced learning effects and improved their effectiveness as a result of 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 are quite comparable to those used by Lee et al. (2007) to measure organizational agility.

**Knowledge Characteristics (moderator)**

Measures for knowledge tacitness and institutionalization were developed originally for this study. Tacitness is defined as the degree to which the organization’s most critical knowledge cannot be expressed in words or numbers objectively and concretely. Institutionalization is defined as the extent to which the organization’s most critical knowledge was contained in the organization’s operations procedures, policies, standard operations, and routines. To the best of our knowledge, there are no generally accepted items for measuring them, we developed our own instruments, some of which were based on the extant literature (Ambrosini and Bowman 2001; Leonard-Barton 1995) and existing measures, such as Zander and Kogut’s (1995) assessment of knowledge codifiability and Haas and Hansen’s (2005)’s assessment of knowledge tacitness of sales proposals.

**Organizational Performance (dependent variable)**

Extant literature presents multiple methods to measure organizational performance. Precise and objective measures, however, are difficult to obtain because those data are highly sensitive. Even when they are available, systematic errors may arise as a result of firm-level differences such as
accounting procedures (Dess and Robinson 1984; Venkatraman and Ramanujan 1987). Existing
literature has also reported that subjective measures of return on investment and sales growth are
found to be significantly correlated with their objective measures, which prompted Dess and
Robinson (1984) to recommend the use of subjective measures in the absence of objective data.
Following this recommendation and common practice in the literature (e.g., Lee and Choi 2003),
we used subjective measures to assess organizational performance.

A total of eight items were adapted from instruments developed by Youndt, Snell, Dean, and
Lepak (1996), Delaney and Huselid (1996), and Lee et al. (2003). These items probed the
participant’s evaluation of the organization’s relative performance as compared with its
competitors.

**Data and Method**

Survey instruments were distributed to 414 representatives in the top 1000 enterprises in Taiwan
ranked by the CommonWealth Magazine,\(^1\) when they participated in an extended education
program sponsored by their companies. The ranking of top 1000 enterprises by the
CommonWealth Magazine was based on firm revenue; the ranking system was regarded as
highly prominent and representative of the profile of Taiwanese businesses. All participants were
selected for the education program based on their substantive amount of work experience with
their organizations; as such they were able to provide useful information regarding the survey
questions.

Of those surveyed, 147 filled out and returned the questionnaire, resulting in 134 unique cases
that completed forms without missing or invalid data, which yields an effective response rate of
32.4%. The sample organizations were well represented in the service sector (N=63, 47.01%),

\(^1\) [https://commonwealthmagazine.org/](https://commonwealthmagazine.org/)
manufacturing (N=41, 30.60%), finance (N=9, 6.72%) and the 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 had worked for their organizations for 3-5 years (N=58, 43.28%), 30.60% had worked for 6-10 years, 17.16% had worked for 11-15 years, and 8.96% had more than 15 years of work experience in their organizations. The extensive work experience of the study informants in their respective organizations suggests that their assessments of their organizations should be reasonably valid and representative of their respective organizations.

To ascertain that the responded firms are not significantly different from those who did not, we compared these two groups with respect to their industries, CommonWealth rankings, and financial performance. No significant difference was observed, which suggests that the non-response bias is not a concern in this study.

**Measurement Validation**

Descriptive statistics of the variables such as means, standard deviations, number of items for each construct and intercorrelations are summarized in Table 1. In this section, we evaluate potential biases from common method variance and validate the measurement model (Straub et al. 2004).

--------------------------------------
Insert Table 1 about Here
--------------------------------------
Common Method Variance

As with all studies using self-reported survey data from single respondents, common method variance is a potential concern. To determine the extent to which common method variance is an issue for the present study, a Harman’s one factor test was conducted using a principle component analysis of all variables measured (Podsakoff and Organ 1986; Podsakoff et al. 2003). Results indicate the presence of twelve components, suggesting that common method variance is unlikely to be a potential source of bias.

Reliability and Validity

For measurement items that were adapted from existing instruments (i.e., items for all constructs except for Knowledge Tacitness and Knowledge Institutionalization), reliability was assessed 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, indicating satisfactory individual item reliability (Hulland 1999).

Table 1 shows that all constructs with existing measures demonstrate a Cronbach’s α of at least 0.7, or a high level of internal consistency (Nunnally 1978). However, Cronbach’s alpha assumes that items are identically correlated with the intended constructs, an assumption that may not be applicable in the current study. Average variance extracted (AVE), on the other hand, represents an alternative assessment of internal consistency (Chin 1998; Chin and Marcolin 1995) that allows items to be weighted differentially with respect to the intended latent construct. Table 1 shows that AVE values range between 0.583 and 0.712, which are above the minimum level of 0.5, as recommended by Chin (1998). In other words, at least 50% of the variance in the items is accounted for by the latent constructs. The square roots of these AVE scores are greater than the corresponding intercorrelations, indicating satisfactory discriminant validity. In summary, results
presented here indicate that measurement items from existing literature used in the present study are reliable and valid.

As discussed earlier, measures for knowledge tacitness and institutionalization were developed originally for this study. These items were analyzed with a principle components analysis, followed by the VARIMAX orthogonal rotation. Two factors with Eigenvalues greater than one were extracted from these eight items for knowledge characteristics. One factor emerged with two items which appeared to tap into the concept of knowledge tacitness, whereas the other factor emerged with three items that corresponded to the concept of knowledge institutionalization. These items were then entered into a confirmatory factor analysis.

The resulting measures of reliability and validity for these two constructs are reported in Table 1. Tacitness demonstrates a high level of internal consistency (Nunnally 1978) with Cronbach’s $\alpha$ of 0.766. However, institutionalization only demonstrates a moderately satisfying level of internal consistency in terms of Cronbach’s $\alpha$ (0.620). The AVE values assure that both measures are internally consistent: AVE is 0.812 and 0.569, respectively, for tacitness and institutionalization, which are above the minimum level of 0.5, as recommended by Chin (1998). In other words, at least 50% of the variance in the items is accounted for by the latent constructs. The square roots of these AVE scores are greater than the corresponding intercorrelations, indicating satisfactory discriminant validity. In summary, results presented here indicate that measurement items for tacitness and institutionalization are reliable and valid.

**Analysis and Results**

After validating the data collected from the survey, we evaluate the structural relationships in the research model. In this section, we first use our data to test the benchmark model of Lee and
Choi’s (2003), that has been empirically established. This analysis allows us to verify the integrity of our measurements as compared with existing research. Then we continue to test the extended organizational learning model. In order to evaluate statistical significance of the path coefficients, we used the bootstrapping approach in PLS, which is a nonparametric technique for estimating structural paths (Efron and Tibshirani 1993). Finally, we tested the hypothesized moderated mediation effects using multiple regression analyses.

**Base Model Verification**

PLS results for verifying the benchmark model are shown in Figure 2. The result are consistent with Lee and Choi’s (2003) findings, and most knowledge creation processes significantly affect organizational creativity. Externalization is the only creation activity that is found not having impact on organizational creativity. The positive relationship between knowledge creation processes and organizational creativity empirical supports existing relationships in the benchmark model. Organizational creativity is also found to affect organizational performance significantly. Therefore, these findings indicate that the Lee and Choi’s (2003) model is valid and our measurement and structural models are consistent with findings in previous literature. Hypotheses 1 and 2 are supported.

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Insert Figure 2 about Here

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**Mediating Effect of Organizational Agility**

A major argument in our extended model is that the relationship between knowledge creation processes and organizational creativity shown in Figure 2, or what we refer to as the overall
effect, is in fact mediated by organizational agility (as posited in Hypothesis 3). In order to test the hypothesis, we followed Baron and Kenny’s (1986) procedure to examine the mediating effect of organizational agility, which includes four steps.

First, we establish the significance of the no-mediation model. This has been done in the base model verification section reported above. Next, we verify that knowledge creation processes positively predict organizational agility, the hypothesized mediator. In step 3, we establish that organizational agility, the hypothesized mediator, significantly affects organizational creativity. Results of these two steps are shown in Figure 3 (the “full mediation” model). Paths from all knowledge creation processes except for externalization to organizational agility are significant. Again, externalization is the only insignificant predictor of organizational agility. In step 4, we verify that the overall effect of the no-mediation model is either reduced or no longer significant when the direct effects of the mediator are accounted for. This can be achieved by comparing Figure 2 and Figure 3. When the size and significance of structural paths are examined, the three paths from knowledge creation processes to organizational creativity that are significant in Figure 2 are no longer significant when organizational agility is added to the model as a mediator in Figure 3.

In other words, the effects of socialization, combination, and internalization on organizational creativity are fully mediated by organizational agility. Compared to the no-mediation benchmark model, the full-mediation model in Figure 3 significantly improves the amount of variance explained in organizational creativity. The R² value increases from 44% to 64%, representing a large effect size of .376 at the structural level (Cohen 1988). These results suggest that the mediation model offers a more powerful explanation of organizational creativity. Hypothesis 3 is therefore supported. The extended model provides a better explanation of improved
organizational creativity from knowledge creation by including organizational agility as a mediator.

Insert Figure 3 about Here

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**Moderating Effect of Knowledge Characteristics**

A second augmentation in our model is to examine the role of knowledge characteristics. Hypotheses 4 and 5 examine the extent to which mediated effects of knowledge creation processes on organizational creativity are moderated by the characteristics of organization knowledge. In other words, we investigate whether the mediating effect reported above may be contingent to the tacitness or institutionalization of the knowledge. To test these *moderated mediation* effects, we follow Muller, Judd, and Yzerbyt’s (2005) guideline 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 shown in Table 1, Pearson’s correlation between knowledge tacitness and institutionalization is not statistically significant ($r = 0.19$, $p = n.s.$), eliminating the concern of multicollinearity between the two moderating variables. Furthermore, tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern as none of the variables demonstrated VIF values greater than 3.

This technique allows us to determine whether the observed pattern indicates moderated mediation as opposed to mediated moderation, a concept that is theoretically distinct from but mathematically similar to 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.

$$Y = \beta_{10} + \beta_{11} X + \beta_{12} Mo + \beta_{13} XM_o + \epsilon_1 \quad (1)$$

Equation 2 assesses the effect of $X$ on the mediator $Me$, i.e., organizational agility, and allows this effect to be moderated by $Mo$.

$$Me = \beta_{20} + \beta_{21} X + \beta_{22} Mo + \beta_{23} XM_o + \epsilon_2 \quad (2)$$

And 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 both effects to be moderated by $Mo$.

$$Y = \beta_{30} + \beta_{31} X + \beta_{32} Mo + \beta_{33} XM_o + \beta_{34} Me + \beta_{35} MeMo + \epsilon_1 \quad (3)$$

To establish moderated mediation, there should be an overall effect by $X$ (i.e., $\beta_{11} \neq 0$), and there should be no overall moderating effect (i.e., $\beta_{13} = 0$). Next, either the effect of $X$ on the mediator is moderated, or the effect of the mediator on $Y$ is moderated. In the first case, both $\beta_{23}$ and $\beta_{34}$ should be significant. In the latter case, both $\beta_{21}$ and $\beta_{35}$ should be significant. Although the residual effect of $X$ 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 2a, 2b, and 2c 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. Externalization has demonstrated no overall or mediated effects on organizational creativity, and is therefore excluded from this analysis.

Table 2a shows that knowledge tacitness has moderated the mediation effect of organizational agility on the impact of socialization on organizational creativity. Specifically, equation 1 shows
that the overall effect of socialization on organizational creativity is significant ($b_{11} = .658, t = 6.863, p < .01$), but is not moderated by knowledge tacitness ($b_{13} = -0.068, t = -0.88, p = .381$). Next, equation 2 shows that the effect of socialization on the mediator organizational agility is significantly moderated by knowledge tacitness ($b_{23} = -.151, t = -2.303, p < .01$). The negative sign of the coefficient suggests that the effect of socialization on organizational agility is lower for organizations whose knowledge is more tacit in nature. Organizational agility, the mediator, continues to affect organizational creativity ($b_{34} = .795, t = 10.169, p < .01$), although this relationship is not moderated by the knowledge tacitness after the effect of socialization is controlled ($b_{35} = .017, t = .237, p = .813$). These results suggest that Hypothesis 4 is supported with respect to socialization, and the relationship is moderated mediation and not mediated moderation. This finding is visually illustrated in Figure 4(a).

Insert Tables 2a-2c about Here

Table 2b shows that knowledge institutionalization (KI) moderates the overall effect of knowledge combination on organizational creativity ($b_{13} = -.209, t = -1.994, p < .05$). The negative sign of this coefficient suggests that the effect of knowledge combination on creativity is higher for organizations whose knowledge is less institutionalized. However, this moderated relationship cannot be accounted for when the organizational agility is included as a mediator, because there is no evidence of prototypical mediated moderation according to Muller et al.’s (2005) guidelines. At the same time, the mediation effect of combination on organizational creativity is not moderated by knowledge tacitness or institutionalization, because the path coefficients are not statistically significant at the values of .019 ($t = .262$) and -.173 ($t = -1.427$).
respectively. In other words, there is no evidence of moderated mediation effects that would support Hypothesis 5.

To summarize, the overall effect of knowledge combination on organizational creativity is moderated by knowledge institutionalization. The same effect is also mediated by organizational agility. However, the mediation process is not moderated, nor is the moderation process mediated. This finding is visually illustrated in Figure 4(b).

Similarly, Table 2c shows that knowledge tacitness has no moderating effect but knowledge institutionalization has moderated the overall effect of internalization on organizational creativity ($b_{13} = -.233, t = -1.968, p = .05$). The negative sign of this coefficient suggests that the moderating effect is stronger for organizations whose knowledge is less institutionalized. However, this moderated relationship cannot be accounted for when the organizational learning is included as a mediator, because there is no evidence of prototypical mediated moderation according to Muller et al.’s guidelines (2005). At the same time, the mediated effect of internalization on organizational creativity is not moderated by knowledge tacitness or institutionalization ($b_{35}$ in the table are $.033 (t = .407)$ and $.005 (t = -.054)$, respectively, which are insignificant). In other words, there is no evidence of moderated mediation effects that would support Hypothesis 4.

To summarize, the overall effect of internalization on organizational creativity is moderated by the institutionalization of an organization’s knowledge. The same effect is also mediated through organizational agility. However, the mediated process is not moderated, nor is the moderated process mediated. Figure 4(c) visually illustrates this finding.
Discussion and Conclusions

Even though organizational creativity has received much attention in the management literature over the last decade, only limited research has established its antecedents and consequences empirically. Motivated by a critical synthesis of literatures on organizational creativity, knowledge creation, and organizational agility, this study thoroughly investigates the effect of knowledge creation processes on organizational creativity and the mediating role of organizational agility in the process. Consistent with prior research, our study shows that knowledge creation processes improve organizational creativity, which subsequently results in superior organizational performance.

Drawing upon an organizational agility perspective allows us to further demonstrate that availability of new knowledge leads to a creative organization by building agility. 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. The present research, in contrast, shows that in order for the 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 the organization to be more agile. When knowledge creation processes afford the
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 find knowledge characteristics to be an important contingency variable. Particularly, organizations relying mostly on explicit knowledge exhibit a higher level of organizational agility from socialization, subsequently resulting in higher levels of creativity, and they do so to a greater extent than do organizations relying primarily on tacit knowledge.

In other words, when an organization’s critical knowledge can be captured in documents, routines, standard operating procedures, and technology, socialization processes create a more pronounced learning effect and hence results in higher creativity and better performance. It is possible that firms whose critical knowledge is primarily tacit already rely on socialization as the primary knowledge management mechanism. Additional processes of socialization, therefore, produce little impact on existing organizational agility, which in turn leads to minimal effect on organizational creativity or firm performance.

In contrast, the degree of knowledge institutionalization moderates the direct effects of combination and internalization on organizational creativity. The combination and internalization processes can lead to higher organizational creativity for organizations with less institutionalized knowledge. This suggests that organizations whose critical knowledge resides mostly in individual employees can benefit more when workers combine and internalize explicit knowledge that is documented. Combining explicit knowledge into new forms of knowledge
promotes organizational creativity, and the effect is more pronounced in organizations whose critical knowledge is less documented at the organizational level.

Why do organizations whose knowledge is less institutionalized show stronger impact on organizational 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 are human resources necessary for an organization to be creative. Internalization, in particular, enables individuals to develop these resources by absorbing and digesting existing documents, procedures, or routines. Since most core knowledge is individual-based, the employee may have a higher motivation to learn from involvement in knowledge creation processes, hence leading to a higher level of overall organizational creativity.

Surprisingly, our study did not find the effect of externalization on enhancing organizational creativity or organizational agility, as reported in Lee and Choi (2003). 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 et al. in press; Zack 1999b). Future studies that examine the impact of externalization on organizational creativity or organizational agility should take into consideration 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 achieved through knowledge articulation and
codification (Zollo and Winter 2002), our research suggests that externalization is a complex process whose impact deserves additional research.

Findings from our research have significant implications for organizational creativity and knowledge management research. They should, however, be considered with the following limitations in mind. First, the survey was administered in a cross-sectional fashion, compromising our ability to make causal inferences. A longitudinal design would strengthen the validity of conclusions about causal relationships among the variables. Second, only firms in Taiwan were included in the survey. So cautions should be taken when the result is to be generalized to firms in other countries or cultures. We do, however, believe that the data collected in Taiwan provide an adequate assessment of Nonaka’s theory, as 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 the concern of common method bias. Although we have done our best to ensure data validity and the exploratory and confirmatory factor analyses have indicated that our data contain multiple factors (Podsakoff et al. 2003), obtaining additional sources of data in future research will further strengthen the validity of the findings.

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 of socialization on organizational creativity that is mediated through organizational agility, knowledge institutionalization moderates the direct effects of combination and internalization on organizational creativity. Although organizational agility mediates the effect of combination and internalization on organizational creativity, these indirect mediation effects are not moderated by knowledge institutionalization. In other words,
knowledge tacitness alters the degree to which socialization impacts organizational agility, whereas knowledge institutionalization changes the extent to which combination and internalization affects organizational creativity. These results suggest that tacitness and institutionalization, although both serve as moderators, impact the knowledge creation – organizational creativity link in fundamentally different ways. Future research should explore theoretical explanations for this empirical discovery.

**Managerial Implications**

Our research suggests that managers searching for strategies to improve organizational creativity could focus on implementing knowledge creation processes. This is not to say that firms should stop forming strategic alliances or partnerships to access knowledge and expertise resources that are created more effectively and efficiently outside the boundary of the firm. Nor does our research imply that other modes of knowledge acquisition such as grafting are less important. Our research simply illustrates the potential of knowledge creation processes in developing a more creative firm.

Another major implication of our findings is the crucial role of organizational agility in fostering organizational creativity. This strongly suggests that managers who intend to develop programs for enhancing organizational creativity and firm performance can 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 whose knowledge is primarily
explicit (such as a manufacturing firm), socialization activities that encourage employees to share their tacit knowledge through collaboration, apprenticeship, or brainstorming may boost creativity through higher organizational learning. For organizations whose knowledge is primarily personal (such as a design house) as opposed to centrally codified or captured in organizational routines, standard operating procedures, or technology, 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 of organizational learning and creativity in organizational knowledge management. A better understanding of the mechanism through which organizational creativity is increased and firm performance is enhanced may allow managers to better capture the effects of different knowledge creation processes and understand the key contingency factors that must be taken into consideration when implementing knowledge management systems.

Acknowledgement

We would like to thank Annalise Winter for her editorial support for this manuscript.

References


Figures and Tables

Table 1: Intercorrelations and Measurement Reliability

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<td>3. Combination</td>
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Note: ** significant at 0.01 level; * significant at 0.05 level
Table 2a. Least squares regression results for socialization as the predictor.

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<td>KT</td>
<td>KI</td>
<td>KT</td>
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<tr>
<td>Soc</td>
<td>.658 (.6863**)</td>
<td>.624 (.7491**)</td>
<td>.609 (.7516**)</td>
<td>.626 (.8611**)</td>
<td>.178 (1.997*)</td>
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<td>Mo</td>
<td>.353 (.930)</td>
<td>1.503 (2.166*)</td>
<td>.705 (2.197**)</td>
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<td>Soc * Mo</td>
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<td>Me * Mo</td>
<td>-</td>
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<td>.017 (.237)</td>
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Table 2b. Least squares regression results for combination as the predictor.

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Table 2c. Least squares regression results for internalization as the predictor.

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<td>KT</td>
<td>KI</td>
<td>KT</td>
<td>KI</td>
<td>KT</td>
</tr>
<tr>
<td>Int</td>
<td>.616 (7.327*)</td>
<td>.594 (8.643**)</td>
<td>.603 (8.737**)</td>
<td>.619 (10.782**)</td>
<td>.149 (1.810)</td>
</tr>
<tr>
<td>Mo</td>
<td>-.050 (-.141)</td>
<td>1.363 (2.384*)</td>
<td>.059 (.200)</td>
<td>-.179 (-.375)</td>
<td>-.147 (-.484)</td>
</tr>
<tr>
<td>Int * Mo</td>
<td>0.007 (.101)</td>
<td>-0.233 (-1.968*)</td>
<td>-0.023 (-.361)</td>
<td>0.080 (.816)</td>
<td>0.003 (.040)</td>
</tr>
<tr>
<td>Me</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.773 (9.270**)</td>
</tr>
<tr>
<td>Me * Mo</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.033 (.407)</td>
</tr>
</tbody>
</table>
Note. Y = dependent variable; Mo = moderator; Me = mediator; KT = Knowledge Tacitness; KI = Knowledge Institutionalization; Org Creativity = Organizational Creativity; Org Agility = Organizational agility; * p<.05; ** p<.01.

Figure 1: Research model
Note: Solid lines represent relationships that are significant 0.05 level. Dotted lines represent non-significant relationships. Numeric values on the paths represent the path coefficients.

Figure 2: PLS model without mediation
Note: Solid lines represent relationships that are significant 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)
Figure 4a: Moderated mediation

Figure 4b: Moderation and mediation

Figure 4c: Moderation and mediation
Appendix

The measures used in the survey study. Responses are made on a 7-point Likert scale that ranges from Strongly Disagree to Strongly Agree.

In your organization, what are the various characteristics of the organization’s knowledge?

Knowledge Tacitness
1. Most of the important knowledge your organization manages can be expressed clearly in words and language. (This item is reverse-scored.)
2. Most of the important knowledge your organization manages can be obtained in documents and manuals. (This item is 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
6. Most of the important knowledge your organization manages is critically impacted when key employees leave. (This item is reverse-scored.)
7. Special skills, equipment and patents managed by your company are extremely important to the business operations.
8. 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 are services are usually codified into computer databases for employees’ reference and education.
6. In your organization, knowledge about products are 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.