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Recommended Citation

Chung, Ting-Ting (Rachel); Liang, Ting-Peng; Peng, Chih-Hung; and Chen, Deng-Neng, "Knowledge Creation and Firm Performance: Mediating Processes from an Organizational Agility Perspective" (2010). *AMCIS 2010 Proceedings*. 478.
<http://aisel.aisnet.org/amcis2010/478>

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

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ABSTRACT

Knowledge creation has emerged as a critical area in information systems research in the past decade (Nonaka 1994). However, the mechanism through which knowledge creation enhances firm performance remains unclear. This paper examines the role of organization agility as a mediator between knowledge creation processes and firm performance. Our survey study of 134 firms indicates that two forms of organizational agility – customer agility and operational agility, significantly and fully mediate the effect of knowledge creation on firm performance. Our findings extend prior research by providing insights into the role of organizational agility in facilitating the effect of knowledge creation processes on firm performance. Implications for researchers and managers are discussed.

Keywords

Knowledge Management, Knowledge Creation, Organizational Agility, Customer Agility, Operational Agility, Firm Performance.

INTRODUCTION

Knowledge management systems (KMS) have rapidly become ubiquitous as firms seek new ways to increase productivity, performance, and agility (Marwick 2001). How firms can turn their knowledge stock into profitable resources represents a crucial issue facing modern organizations (Davenport and Prusak 2000). Because successful harnessing of the firm's valuable knowledge assets depends crucially on information technology, the domain of knowledge management often constitutes a core responsibility of IS managers and executives (Sprague 1995; Swanson and Culnan 1978). Research in knowledge management, particularly inquiries as to how knowledge management enhances firm performance, has grown substantially in the information systems (IS) area.

Previous literature has indicated that simply maintaining existing knowledge to implement known practices and produce predictable results, is insufficient in the dynamic, high-velocity market (Eisenhardt and Martin 2000). The firm must constantly create new knowledge, or, in other words, generate novel and useful ideas, in order to attain and sustain its competitive advantage over time (Parent Gallupe Salisbury and Handelman 2000). The strategic value of knowledge creation initiatives has been demonstrated empirically (Lee and Choi 2003), although the mechanism underlying the relationship between knowledge creation and firm performance is rather unclear.

In this paper we argue that knowledge creation efforts contribute to firm performance by enhancing the business's agility. Specifically, we propose that knowledge creation adds value by increasing the firm's customer agility and operational agility. The primary purpose of this research is to build a model that extends the growing stream of work on the strategic value of knowledge creation (Erden von Krogh and Nonaka 2008; Nonaka 1994; Nonaka Byosiere Borucki and Konno 1994; Nonaka and Takeuchi 1995; Nonaka and Toyama 2003; Nonaka von Krogh and Voepel 2006). We demonstrate that new knowledge not only develops better routines that make operations more efficient and effective, it also helps organizations sense environmental changes and respond to them rapidly.

KNOWLEDGE CREATION AS A COMPETITIVE CAPABILITY

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 1999).

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 1999). 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 (Leonard-Barton 1992). 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

Here, 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 dynamic 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. 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). 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. Internalization, on the other hand, occurs when explicit knowledge is transformed into tacit knowledge through practice, physical operations, or bodily experience.

Knowledge Creation and Firm Performance

For these knowledge creation processes to be considered valuable firm resources, they must be able to generate sustained performance. 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 (DeCarolis and Deeds 1999; Lee et al. 2003). However, a key question remains: What are the mechanisms underlying the relationship between knowledge creation processes and organizational performance?

AN ORGANIZATIONAL AGILITY VIEW

As modern organizations adapt to turbulent and hypercompetitive environments, organizational agility, or their ability to sense environmental changes and respond to them appropriately with speed and intensity (Overby Bharadwaj and Sambamurthy 2005, 2006), becomes increasingly crucial for firm survival (D'Aveni 1994; Dove 2001; Sambamurthy Bharadwaj and Grover 2003). There is strong reason to believe that knowledge creation processes 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). The key elements of organizational agility are the ability to sense environmental changes, and the ability to respond rapidly (Overby et al. 2006; Weill Subramani and Broadbent 2002). In the following section, we demonstrate that the relationship between knowledge creation and firm performance is predicated on two forms of organizational agility – customer agility and operational agility.

The Mediating Role of Organizational Agility

While other scholars argue that strategic IT, such as IT infrastructure, provides a platform for agility (Sambamurthy et al. 2003; Weill et al. 2002), we suggest that knowledge creation processes similarly supply a solid basis for firms to detect environmental changes and launch rapid responses. 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 (Sambamurthy et al. 2003). People and information are key differentiators in the presence of agile competition (Goldman Nagel and Preiss 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 interactions 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 information technology 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 clockspeed (Donnelan et al. 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 et al. 2005; Nonaka et al. 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 (Andrade and Fladeiro 2002; 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 firm performance by allowing new ideas to flow and by encouraging risk taking and experimentation. "Innovation is intendedly adaptive, and it is undertaken typically in response to unfamiliar, unexpected, or nonroutine problems" (Glynn 1996, p.1095). An agile organization is nimble in both sensing problems and unexpected changes arising in the environment, and developing an opposite response plan and executing it in a speedy manner. The agile organization's response is often an innovation with varying degrees of proven track records. 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 innovation 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).

The impact of knowledge creation on firm performance, therefore, could be mediated by organizational agility. Specifically, two forms of organizational agility are critical to this mediation process - customer agility and operational agility. Customer agility is "the co-opting of customers in the exploration and exploitation of opportunities for innovation and competitive action moves" (Sambamurthy et al. 2003, p.245). More concretely, customer agility allows the firm to quickly implement demand-side initiatives such as a manufacturer's new system to monitor retail sales and inventory level (Weill et al. 2002). When knowledge creation processes are in place, firms are able to absorb customers' ideas rapidly as sources of innovation.

They are also competent in engaging customers in collaborative knowledge creation projects, generating innovation that is useful from the customer's perspective. This heightened level of organizational agility as a result of customer engagement facilitates the way knowledge creation processes create firm value:

Hypothesis 1: Customer agility mediates the relationship between knowledge creation and firm performance.

Operational agility, on the other hand, refers to “the ability of firms’ business processes to accomplish speed, accuracy, and cost economy in the exploitation of opportunities for innovation and competitive action” (Sambamurthy et al. 2003). Operational agility reflects the firm’s ability to quickly launch internally focused initiatives, such as a publishing house’s all-digital workflow (Weill et al. 2002). As discussed earlier, greater knowledge reach and richness as a result of knowledge creation promote tighter integration and coordination across functional units. Moreover, knowledge creation processes such as socialization encourage employees to collaborate across diversity teams and functional departments (Dove 2001). This sophisticated level of coordination and collaboration allows the organization to quickly reconfigure its existing processes in response to changing environments and to seize growth opportunities promptly. This heightened level of organizational agility as a result of operational flexibility facilitates the way knowledge creation processes create firm value (Dove 2001):

Hypothesis 2: Operational agility mediates the relationship between knowledge creation and firm performance.

Figure 1 visually summarizes the research model consisting of these two hypotheses.

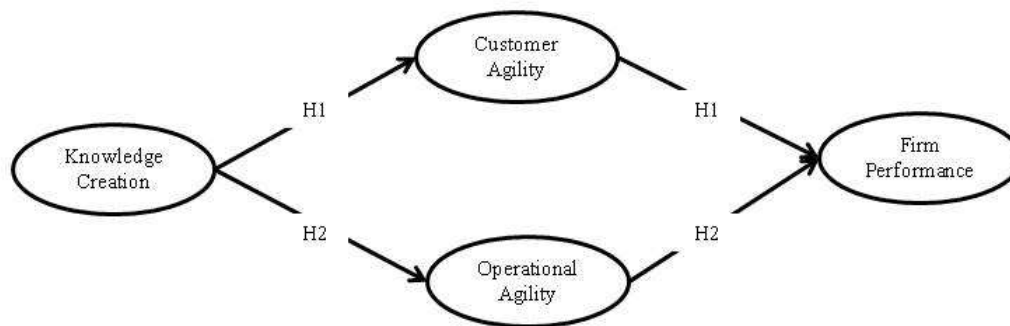


Figure 1. Summary of Research Model

RESEARCH DESIGN

We present an empirical study designed to test the hypotheses developed here with a cross-sectional survey.

Construct Operationalization

Our theoretical model motivates the measurement of three groups of variables: (1) Knowledge creation processes in terms of socialization, externalization, combination, and internalization, (2) organizational agility, and (3) organizational performance. Measurements of these variables, collected using the 5-point Likert scale, are described in detail below. Actual survey items are available upon request.

Knowledge creation processes

A total of 24 items were adapted from developed and validated instruments in the literature (Becerra-Fernandez et al. 2001; Lee et al. 2003; Nonaka et al. 1994; Sabherwal and Becerra-Fernandez 2003) to measure knowledge creation processes. Each of the four dimensions – socialization, externalization, combination, and internalization – was measured with six survey items. Data from the six items were then aggregated to indicate each of the four dimensions.

Organizational Agility

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 defined by Lee

et al. (2007) to measure organizational agility. These items fall into two subcategories: Eight questions reflect the construct of customer agility, while the other four indicate the conceptual domain of operational agility.

Firm Performance

Following this recommendation and common practice in the literature (e.g., Lee et al. 2003), we used subjective measures to assess firm 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.

Subjects and Data Collection

Survey instruments were distributed to 414 representatives in the top 1000 enterprises in Taiwan ranked by the CommonWealth Magazine (2004), 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, which resulted in 134 unique cases that completed forms without missing or invalid data. This represented an effective response rate of 32.4%. The sample organizations were well represented in the service sector (N=63, 47.01%), manufacturing (N=41, 30.60%), finance (N=9, 6.72%) and the other (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%). 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 Boudreau and Gefen 2004).

Constructs	Sub-Dimensions	Mean	S.D.	# Items	Cronbach's α	AVE	Composity Reliability	1	2	3	4
1. Knowledge Creation	Socialization	4.82	0.85	6	0.86	0.61	0.903				
	Externalization	4.41	0.98	6	0.892	0.65	0.917				
	Combination	4.27	1.14	6	0.918	0.71	0.937				
	Internalization	4.67	0.97	6	0.856	0.919	0.58	0.893	0.942	0.89666	
2. Customer Agility		4.7	0.11	8	0.949	0.74	0.958	0.692	0.86023		
3. Operational Agility		4.62	0.18	4	0.857	0.7	0.903	0.751	0.644	0.83666	
4. Firm Performance		4.5	0.98	8	0.938	0.7	0.949	0.605	0.692	0.669	0.83905

Table 1. Descriptive Statistics and Intercorrelations (N=134; square roots of AVE values shown in bold on the diagonal)

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 MacKenzie Lee and Podsakoff 2003). Results indicate the presence of seven components, suggesting that common method variance is unlikely to be a potential source of bias.

Reliability and Validity

As all measurement items that were adapted from existing instruments, reliability was assessed in terms of item reliability and internal consistency. A Partial Least Squares (PLS) analysis using SmartPLS version 2.0 (Ringle Wende and Will 2005) 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). Similarly, AVE values range between 0.583 and 0.712, which are above the minimum level of 0.5, as recommended by Chin (1998) for adequate internal consistency. The square roots of these AVE scores (shown in bold on the diagonal) are greater than the corresponding intercorrelations, indicating satisfactory discriminant validity. In summary, results presented here indicate that measurement items used in the present study are reliable and valid.

DATA ANALYSIS AND RESULTS

We tested the research model using PLS analysis, again using SmartPLS version 2.0. Statistical significance of the path coefficient estimates was generated by a bootstrapping procedure that iteratively re-sampled the data 500 times.

Mediating Effect of Organizational Agility

We posited that the relationship between knowledge creation processes and firm performance is in fact mediated by customer agility and operational agility. We followed the Baron and Kenny (1986) procedures to examine the mediating effect of organizational agility, which includes four steps.

First, we must establish that knowledge creation has a direct and significant impact on firm performance. This was verified by testing a no-mediation model illustrated in Figure 2. Knowledge creation processes indeed impacted firm performance significantly. Next, we verified that knowledge creation processes positively predicted customer agility and operational agility, the hypothesized mediators. In step 3, we established that customer agility and operational agility, the hypothesized mediators, significantly affected firm performance. Results of these two steps are shown in Figure 3. In step 4, we verified 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. When the size and significance of structural paths are examined, the direct path from knowledge creation to firm performance that was significant in Figure 2 was no longer significant after customer agility and operational agility were added to the model as mediators in Figure 3.

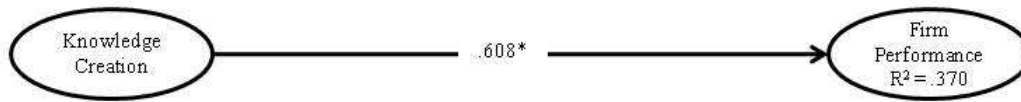
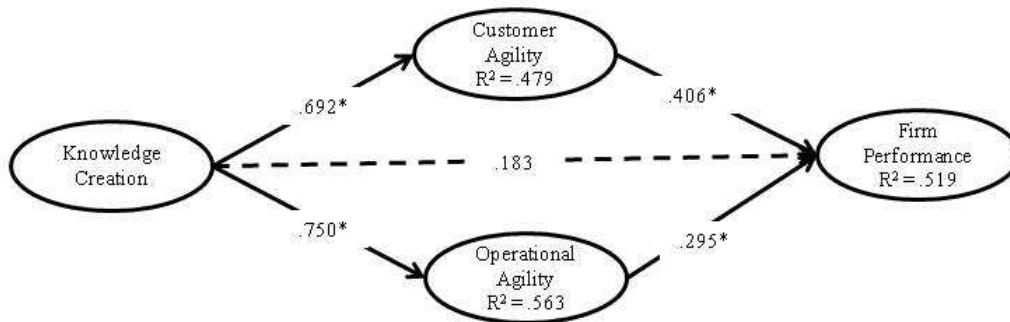


Figure 2. PLS Results for the No-Mediation Model



*P < .05

Figure 3. PLS Results for the Mediation Model

In other words, the effect of knowledge creation on firm performance was fully mediated by customer agility and operational agility. Compared to the no-mediation model shown in Figure 2, the full-mediation model in Figure 3 significantly improved the amount of variance in firm performance that was covered by the independent variables. The R² value increased from 37% to 52%, representing a large effect size of .328 at the structural level (Cohen 1988). These results suggest that the mediation model proffers a powerful explanation of firm performance. Hypotheses 1 and 2 are therefore both supported.

DISCUSSION

Even though knowledge creation has received much attention in the management literature over the last decade, only limited research has established its strategic value empirically. This study provides new insights into the effect of knowledge creation processes on firm performance from an organizational agility perspective. Our study shows that knowledge creation processes contribute to firm performance via increasing customer agility and operational agility.

Drawing upon an organizational agility perspective allows us to demonstrate that availability of new knowledge leads to a productive organization by building agility. This agility perspective complements the existing approach to the value of knowledge creation that focuses on the role of organizational creativity (Lee et al. 2003). The present research, in contrast, suggests that knowledge creation processes such as socialization, combination and internalization improve firm performance because they allow the organization to be more agile.

Research Implications

This study has important implications for both the knowledge management literature and the organizational agility literature. Our findings expand the knowledge creation literature by demonstrating how knowledge creation processes create strategic value through promoting organizational agility. At the same time, this research expands the organizational agility literature by providing some of the first empirical evidence for its role in knowledge management and firm performance. In particular, this research offers empirical support for the two forms of agility theorized in Sambamurthy et al.’s (2003) seminal work.

Organizational agility has been theorized along multiple dimensions. In addition to customer and operational agility discussed here, at least two other frameworks are available – Overby et al. (2006) discuss sensing and responding as the two primary components of agility, whereas Lee et al. (2007) examine entrepreneurial versus adaptive agility as the two primary dimensions. How knowledge creation processes relate to these other forms of organizational agility demands future investigation.

Managerial Implications

Our research suggests that managers searching for strategies to improve organizational agility 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 agile firm.

Limitations

Findings from our research have significant implications for organizational agility 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.

CONCLUSION

This research advances our understanding of knowledge creation processes by demonstrating the role of organizational agility in facilitating their impacts on firm performance. In the future, we expect more research on how knowledge management initiatives promote organizations' agility levels and create strategic value.

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