Knowledge Creation and Financial 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 [1]. One of the mechanisms through which knowledge creation enhances firm performance has been theorized as organizational agility. This paper empirically examines the role of organization agility as a mediator between knowledge creation processes and financial firm performance. Our survey study of 134 firms combined with objective measures of firm performance indicates that two forms of organizational agility – customer agility and operational agility, significantly mediate the effect of knowledge creation processes on firm performance. Our findings confirm prior research results that were based exclusively on survey data, and provide additional discussions on the role of organizational agility in facilitating the effect of knowledge creation processes on firm performance. Implications for researchers and managers are discussed.

1. Introduction
Organization agility, the ability to sense environmental changes and respond to them appropriately with speed and intensity, has become an increasingly critical capability that businesses are eager to pursue in order to thrive in today’s hypercompetitive environment [2, 3]. At the same time, knowledge management systems (KMS) have rapidly become ubiquitous as firms seek new ways to increase productivity, performance, and agility [4]. How firms can turn their knowledge stock into profitable resources represents a crucial issue facing modern organizations [5]. 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 [6, 7]. Research in knowledge management, particularly inquiries as to how knowledge management enhances firm performance, has grown substantially in the information systems (IS) area.

The goal of this research is to empirically confirm prior work suggesting that knowledge creation efforts contribute to firm performance by increasing the business’s agility [8]. With data from a single survey, Chung et al. [8] found that knowledge creation added value by increasing the firm’s customer agility and operational agility. In this work we extend this line of research by replacing self-reported measures of firm performance with objective measures of financial performance as the dependent variable.

Consistent with the growing stream of work on the strategic value of knowledge creation [1, 9-14], this study demonstrates 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. Simply maintaining existing knowledge to implement known practices and produce predictable results, is insufficient in the dynamic, high-velocity market [15]. 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 [16].

In this paper we first review the theoretical framework presented in Chung et al. [8]. We then present and discuss the empirical findings using the same dataset updated with objective measures of firm performance as the dependent variable.
2. Knowledge Creation as a Competitive Capability

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. In contrast, knowledge that is publicly available to all firms or commonly shared among industry players rarely provides such benefits. Internally created knowledge is more likely to lead to innovation than knowledge acquired through imitation [17]. Conner and Prahalad [18], 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 [19]. 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 [20].

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 [20]. As demonstrated by Leonard-Barton [24], managerial systems for knowledge creation form an important dimension of core capabilities because they enable an organization to learn [21]. 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 organizational process for establishing knowledge asymmetry, converting resources into performance, and resulting in competitive advantages [22].

3. 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 [1, 10]. 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 [1]. 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 [23, 24], 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 [1]. 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.

4. 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 [25] 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 [26] and organizational performance [14, 27]. However, a key question remains: What are the mechanisms underlying the relationship between knowledge creation processes and organizational performance?

5. An Organizational Agility View

As modern organizations adapt to turbulent and hypercompetitive environments, organizational agility, becomes an increasingly crucial imperative for firm survival [28-30]. There is strong reason to believe that knowledge creation processes create competitive advantage by enhancing the organization’s agility. Following Sambamurthy, Bharadwaj, and Grover [29], 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 change and the ability to respond rapidly [3, 31]. In the following section, we demonstrate that the relationship between knowledge creation and firm performance is predicated on two forms of organizational agility – entrepreneurial agility and adaptive agility.
5.1. The Mediating Role of Organizational Agility

While other scholars argue that strategic IT, such as IT infrastructure, provides a platform for agility [29, 31], 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 [29]. People and information are key differentiators in the presence of agile competition [32], 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” [29, 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 [33]. 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 [33, 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 [29]. 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 [11, 33].

Greater knowledge reach and richness fostered by knowledge creation processes enable stronger organizational agility [29]. 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 [29, 34]. 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 [28].

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” [35, 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 [2, 29].

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” [29, 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 [31]. 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” [29]. Operational agility reflects the firm’s ability to quickly launch internally focused initiatives, such as a publishing house’s all-digital workflow [31]. 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 [30]. 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 [30]:

**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**

6. Research Design

We present an empirical study designed to test the hypotheses developed here with data from a cross-sectional survey and objective measures of firm performance available from public sources.

6.1 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.

6.1.1. Knowledge Creation Processes. A total of 24 items were adapted from developed and [10, 14, 26, 36] 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.

6.1.2. Organizational Agility. Twelve items measuring organizational agility were adapted from Gold et al. [37]. 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 [22]. 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. [38] 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.
6.1.3. Firm Performance. Financial performance measures of the participating firms are public available. The study collected two performance measures which were related to organizational agility: firm net profit and firm operational cost. Such measures are available from a Taiwan stock exchange corporation website. In our analysis we controlled for one important variable. Although financial measures of firm performance are generally considered to be objective, firm size is highly associated with firm profit and operational cost. Thus, following past research [39], we entered firm size into our model as a control variable.

6.2 Subjects and Data Collection

Survey instruments were distributed to 414 representatives in the top 1000 enterprises in Taiwan ranked by the CommonWealth Magazine [40], 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 ranged from banks, retail to computer OEM, and were well represented in the service sector (N=63, 47.01%), manufacturing (N=41, 30.60%), finance (N=9, 6.72%) and other industries (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.

6.3 Survey Measurement Validation

Descriptive statistics of the survey measures such as means, standard deviations, number of items for each construct and intercorrelations are summarized in Table 1. These values were obtained to validate the measurement model [41].

6.2.1. Reliability and Validity. As all survey 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 0.84 and 0.90, 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.

6.4 Objective Measures of Firm Performance

In addition to survey data, we obtained financial performance measures of participating firms. Specifically, we used the delta value of firm cost from 2004 to 2005, and the delta value of firm net profit from 2004 to 2005 to formatively indicate the construct of firm performance. Descriptive statistics of these two measures are summarized in Table 2.

7. 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 1000 times.
7.1 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 [42] 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.

8. Discussion

While prior research offers preliminary evidence on the effect of knowledge creation processes on firm performance from an organizational agility perspective [8], this study uses objective measures of firm financial performance to further substantiate the hypothesis that knowledge creation processes contribute to firm performance via increasing customer agility and operational agility.

Findings from this study offer two methodological improvements to this line of research. First, replication offers a valuable, although under-utilized, approach to verify the robustness of a research model. Because the current incentive system in the academic does not encourage replications [43], few models of knowledge management have been tested through replication. This rare opportunity to triangulate findings using a complementary source of data strengthens the empirical basis of the agility perspective. Moreover, by combining survey data with objective measures of financial reports, this study eliminates concerns of common method bias. Because the financial performance data came from a time period after the collection of the survey data, the longitudinal nature of the dataset enhances our confidence with causal inferences amid prior limitations of a single-respondent and cross-sectional survey.

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 [14]. 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.

8.1 Research Implications

This study offers 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 [29] 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. [3] discuss sensing and responding as the two primary components of agility, whereas Lee et al. [38] 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.

8.2 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 and high-performing firm.

8.3 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. Most importantly, only firms in Taiwan were included in the survey. So caution should be taken when conclusions are to be generalized to firms in other countries or cultures. Findings reported here may reflect economic characteristics that are unique to the region. 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 [44]. This study also contributes to the growing body of empirical evidence from emerging markets (e.g., [22] & [23]) that extends the literature otherwise dominated by findings based on Western economies.

8.4 Conclusion

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

| Table 1. Descriptive Statistics and Intercorrelations of Survey Measures (Square roots of AVE values shown in bold on the diagonal) |
|---|---|---|---|---|---|---|
| Constructs Sub- Dimensions | Mean | S.D. | # Items | Cronbach’s α | AVE | Composity Reliability |
| 1. Knowledge Creation Socialization | 4.82 | 0.85 | 0.99 | 6 | 0.86 | 0.92 | 0.61 | 0.80 | 0.90 | 0.86 |
| | 4.41 | 0.98 | 6 | 0.89 | 0.65 | 0.92 | 0.94 |
| | 4.27 | 1.14 | 6 | 0.92 | 0.71 | 0.94 |
| | 4.67 | 0.97 | 6 | 0.86 | 0.58 | 0.89 | 0.90 |
| 2. Customer Agility | 4.70 | 0.11 | 8 | 0.95 | 0.74 | 0.96 | 0.69 | 0.86 |
| 3. Operational Agility | 4.62 | 0.18 | 4 | 0.86 | 0.70 | 0.90 | 0.75 | 0.64 | 0.84 |

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<td>335,883,103</td>
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