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Structured knowledge processes and firm performance: The role of organizational agility☆

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ABSTRACT

Organizational agility facilitates the search and retrieval of relevant knowledge and enables businesses to apply this knowledge to develop high-quality services and products or react to the emergence of new competitors. This work develops a research model that explores the relationships among knowledge management structures, organizational agility, and firm performance. The empirical study examines these relationships using partial least squares structural equation modelling on a dataset of 112 large Spanish companies. The results of this modelling exercise support the effectiveness of a specific set and sequence of knowledge management processes and confirm not only the direct effect of knowledge application on organizational performance, but also the mediating effect of organizational agility in this relationship.

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1. Introduction

Organizational agility refers to the capability of a company to rapidly change or adapt in response to changes (Tallon & Pinsonneault, 2011). Organizational agility is fundamentally necessary for organizations facing changing conditions to use production factors to achieve the objectives of the organization, employees, and shareholders (Shahrabi, 2012). To address these issues, organizational agility requires firms to quickly manage their knowledge when responding to a changing environment, and the market environment in particular (Kodish, Gibson, & Amos, 1995).

Knowledge in an organization originates from both inside and outside the firm (Martelo & Cegarra). Although so much of organizational knowledge seems to come from external evaluations and observations, organizations have to make use of internal experience, expertise, and processes to interpret this external knowledge and to convert this

knowledge into an explicit form that those firms can reuse (Ortega-Gutiérrez, Cegarra-Navarro, Cepeda-Carrión, & Leal-Rodríguez, 2015). Hence, the enhancement of an organization's agility develops through the combination of what Martelo and Cegarra (2014) refer to as knowledge structures.

Although some similarities between organizational agility and knowledge management (KM) exist, these concepts are very different. While KM involves the structures that organizations use to assemble, integrate, and use knowledge as leverage in an appropriate manner (Liao, Chuang, & To, 2011; Nonaka & Takeuchi, 1995), organizational agility refers to the continuous close coordination among business, stakeholders, and other environmental factors allowing the organization to respond effectively to constantly changing situations (van Oosterhout, Waarts, & Van Hillegersberg, 2006). Consequently, firms need to find ways not only to adequately manage the knowledge but also to ensure the development and subsequent sustaining of the organization's agility (Newey & Zahra, 2009; Shahrabi, 2012).

Although an extensive literature promoting knowledge structures and their direct link to organizational performance exists (Gold, Malhotra, & Segars, 2001; Martelo & Cegarra, 2014; Mills & Smith, 2011), few studies identify variables that mediate this relationship and, more specifically, no previous research analyzes the potential mediating effect of organizational agility on this relationship. Therefore, this study addresses the gap in the literature by aiming to identify how knowledge structures influence firm performance in the presence of organizational agility.

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2. Conceptual framework

2.1. The relationship between knowledge structures

Knowledge acquisition consists of making external knowledge available to others within the organization (Nevis, DiBella, & Gould, 1995). Many terms exist to describe this process in the whole, or in part, such as absorptive capacity (Cepeda & Vera, 2007; Cohen & Levinthal, 1990; Wu, 2007) or knowledge transfer (Ipe, 2003). In this research, knowledge acquisition (KAc) involves the combination of components that allow firms to create new knowledge about events, trends, and relationships in the external environment of the organization by sharing information with its stakeholders (Martelo & Cegarra, 2014; Ortega-Gutiérrez et al., 2015).

Although acquiring external knowledge is a critical step, noticing that all so-called knowledge generated within these external structures is not necessarily good knowledge is crucial (Cegarra, Wensley, & Eldridge, 2014). For example, inappropriate or false beliefs generated via unsupported belief, rumor, and gossip are just some of the examples that illustrate organizational members' propensity to create and accept partial truths and even outright falsehoods. Hence, once the acquisition of knowledge occurs, the next step must be knowledge's transformation into relevant knowledge (Fosfuri & Tribó, 2008).

Following Martelo and Cegarra (2014), this study suggests that while the ability to acquire external knowledge within the organization appears as KAc, knowledge conversion (KC) occurs when the firm transforms external knowledge into routines or processes and thus becomes part of that firm's knowledge and accumulated experience. The conversion of knowledge not only refers to a basic tool that supports the creation of social knowledge, but the conversion of knowledge also constitutes the vehicle through which firms can review, update, and refine the inappropriate or false beliefs generated via KAc structures, in some cases deleting them altogether (Gold et al., 2001).

Knowledge application (KAp) refers to a process that ensures that once a firm acquires knowledge, that firm uses that knowledge properly (Gold et al., 2001). Many terms describe the process of KAp: knowledge leverage (Ipe, 2003); knowledge use (Earl, 2001); and knowledge utilization (Jantunen, 2005). This study posits that the application of knowledge implies a KM process that requires being able to successfully transfer knowledge from one context to another (Martelo & Cegarra, 2014). One of the most common ways to apply knowledge is adopting the best practices of a leader firm, to identify the relevant knowledge and to use this relevant knowledge (Sandhawalía & Dalcher, 2011). Another aspect of KAp refers to collective routines, procedures and problem-solving processes that firms can use to apply relevant knowledge in decision-making (Martelo & Cegarra, 2014).

The literature shows two approaches to investigating the relationship between knowledge structures and organizational performance. The first approach uses composite constructs to measure knowledge structures, and its proponents find positive effects of knowledge structures on organizational performance (Gold et al., 2001). This method enables managers and researchers to focus on the main effects of knowledge, achieving parsimony; however this method sheds little light on the links between individual knowledge structures and their potential contribution to organizational performance. The second approach concentrates on individual knowledge structures and analyzes the impact of these individual knowledge structures on organizational performance (Mills & Smith, 2011; Seleim & Khalil, 2007). However, results within this research stream are less conclusive. For instance, Seleim and Khalil (2007) conclude that, from the knowledge structures studied (acquisition, creation, and application), only knowledge application relates to organizational performance. Similarly, Mills and Smith (2011) find that several knowledge structures, with the exception of knowledge conversion, affect organizational performance.

This study is consistent with other work (Martelo & Cegarra, 2014; Nevis et al., 1995; Ortega-Gutiérrez et al., 2015; Seleim & Khalil, 2007)

in that the above discussion (i.e., KAc → KC → KAp) implies a serial linear process. Hence, the study proposes the following hypotheses:

H1. A positive relationship exists between knowledge acquisition and knowledge conversion.

H2. A positive relationship exists between knowledge conversion and knowledge application.

2.2. Linking knowledge application with firm performance through organizational agility

Van Oosterhout et al. (2006) define organizational agility as the ability of an organization to develop and exploit its knowledge structures to compete successfully in uncertain and unpredictable environments. Although the knowledge management literature indicates that knowledge application affects directly organizational outcomes (Alavi & Leidner, 2001; Bierly, Damanpour, & Santoro, 2009), the application of knowledge can also be a major driver for relearning and therefore a major vehicle for creating new knowledge (Tallon & Pinsonneault, 2011). Knowledge application can also be the source of new knowledge through reviews of after-the-event account of the change process leading to the identification of the causes of departure from expectations (Shahrabi, 2012). For example, knowledge application strongly supports characteristics such as transparency, responsiveness, common language, and shared understanding (Gunasekaran, 1998). As Tallon and Pinsonneault (2011) indicate, companies using existing knowledge may have a greater opportunity to leverage its internal business processes, which in turn can help to respond appropriately to market volatility and dynamism.

This study draws on prior research indicating that the process involving the application of knowledge is essential for organizational agility because this knowledge process is essential to cope with market or demand changes that are unpredictable and uncertain (van Oosterhout et al., 2006). Organizational agility also has a positive relationship with organizational performance because such agility may result in fostering an organization's ability to respond to environmental changes in a purposeful manner and to develop and offer high-quality services and products (Alegre & Sard, 2015; Shahrabi, 2012). Indeed, prior researchers propose that organizational agility has a positive effect on performance (Tallon & Pinsonneault, 2011). Researchers propose that organizations lacking in agility will be less able to adapt existing process and routines to reflect changes in the environment that new knowledge signals. Given that such adaptation influences directly firm performance, the study proposes the following hypothesis:

H3. Organizational agility mediates the relationship between knowledge application and firm performance.

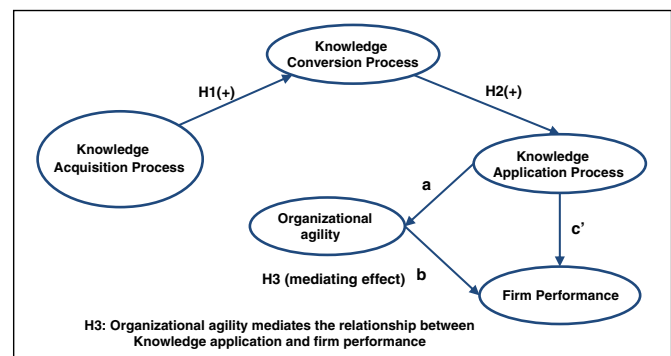


Fig. 1. The proposed research model.

Fig. 1 represents the model this study proposes. The model assumes that organizational agility mediates knowledge application's positive effect on firm performance.

3. Research methodology

3.1. Data collection

The target population of this study is Spanish companies with more than 100 employees that make use of the Editran tool, a platform for communications over data networks and the Internet, permitting the exchange of information and knowledge over advanced solutions that enable direct connectivity between IT applications and devices through different operating systems. This platform enables the interaction of heterogeneous business activities, entities, and public bodies. The study identifies 360 employees from the SABI (Sistema de Análisis de Balances Ibéricos) database and contacted them to participate. First, a pilot study took place and, following that, a questionnaire. The administration of the survey to the CEO of the companies consisted of a telephone interview and the unit of analysis for this study was the company. The administration of the surveys occurred over a period of 2 months, from October 2012 to November 2012. The resulting data sample was of 110 valid questionnaires, yielding a response rate of 33.55%.

3.2. Measures

Constructs and associated indicators in the measurement model appear in the Appendix.

Consistent with the findings of Martelo and Cegarra (2014), items that addressed knowledge acquisition (KA_c) mixed with issues regarding the encouragement of individuals in the organization to track changing markets and share market intelligence with external agents. The final revised scale consists of four items to measure potential knowledge acquisition and six items to measure realized knowledge acquisition.

The study measured KC and KAp processes following items in previous literature (Gold et al., 2001). These processes represent a firm's capacity to make existing knowledge useful and to actually apply the knowledge, respectively. The final cleaned scale consists of 10 items to measure KC and 11 items to measure KAp.

As appears above, organizational agility (OA) may refer to the firm's capability to deal with changes that come from the business environment by using rapid and innovative responses. This study measures OA using items adapted from Lu and Ramamurthy's (2011) work. The final revised scale consists of 6 items to measure KC.

Finally, the study operationalized firm performance (FP) using items from previous research (Judge & Douglas, 1998; Quinn & Rohrbaugh, 1983) through which respondents rated their organization's performance relative to others in the industry. The final revised scale consists of 10 items to measure FP.

3.3. Instrument validation

The minimum sample size necessary for testing the theoretical model shown in Fig. 1 would be 80 (Barclay, Higgins, & Thompson, 1995). With 110 responses, the partial least squares (PLS) analysis appears to have sufficient power.

The measures from the dataset underwent a refining process by assessing their unidimensionality and reliability. First, the study made an initial exploration of unidimensionality using principal component analyses. In each analysis, eigenvalues were greater than 1, lending preliminary support to a claim of unidimensionality in the constructs. Next, this study verified the reliability and validity of the measurement model (Barclay et al., 1995). Table 1 shows that all the indicator loadings are above 0.65, the composite reliabilities (CR) values

Table 1
Reliability and convergent validity.

Construct	Item loading ^a	t-Statistic	Cronbach's alpha	CR & AVE		
Potential knowl. acquisition						
PKA1	0.81	20.96	0.77	CR = 0.85 AVE = 0.70		
PKA2	0.75	14.57				
PKA3	0.75	13.72				
PKA4	0.77	14.48				
Realized knowl. acquisition						
RKA1	0.81	22.33	0.87	CR = 0.91 AVE = 0.76		
RKA2	0.83	26.06				
RKA3	0.79	6.78				
RKA4	0.81	19.47				
RKA6	0.84	23.93				
Knowledge conversion						
KC1	0.79	18.03	0.93	CR = 0.95 AVE = 0.82		
KC2	0.87	35.66				
KC4	0.91	55.70				
KC5	0.86	28.45				
KC6	0.81	19.55				
KC7	0.83	25.44				
KC10	0.86	34.46				
Knowledge application						
KA1	0.88	40.05			0.96	CR = 0.96 AVE = 0.79
KA2	0.91	47.71				
KA3	0.92	50.53				
KA4	0.91	40.74				
KA5	0.88	35.60				
KA6	0.91	49.22				
KA7	0.87	30.21				
KA11	0.83	21.79				
Organizational agility						
OA1	0.76	16.58	0.92	CR = 0.90 AVE = 0.76		
OA2	0.80	25.28				
OA3	0.79	18.76				
OA4	0.88	33.72				
OA5	0.88	0442.				
OA6	0.78	16.34				
Firm perf. 1						
FP1	0.84	27.72	0.88	CR = 0.91 AVE = 0.77		
FP2	0.84	25.98				
FP3	0.82	24.01				
FP4	0.76	14.81				
FP5	0.84	25.19				
Firm perf. 2						
FP6	0.89	37.97	0.88	CR = 0.92 AVE = 0.80		
FP7	0.93	54.52				
FP8	0.86	30.70				
Firm perf. 3						
FP9	0.88	18.73	0.66	CR = 0.85 AVE = 0.76		
FP10	0.84	18.78				

CR: composite reliability; AVE: average variance extracted.

^a All item loadings are significant at $p < 0.01$.

range from 0.85 to 0.96, and the average variance extracted (AVE) ranges from 0.59 to 0.80. All three conditions for convergent validity thus hold (Fornell & Larcker, 1981).

As appears in Table 2, discriminant validity holds for the model, because the AVE for each construct is greater than the shared variances between pairs of constructs (Fornell & Larcker, 1981). Thus, overall measurement items have adequate item reliability.

By using two different methods, the study assesses the extent of common method bias. First, the study uses the Harman's one-factor test by entering all the indicators into a principal components factor analysis (Podsakoff & Organ, 1986). With all indicators entered, no single factor accounted for threshold of 50% variance, indicating no substantial common method bias. Second, this study checked for bivariate correlations between constructs and did not find extremely high correlations ($r > 0.90$) and, thus, this test confirmed no evidence of common method bias (Bagozzi, Yi, & Phillips, 1991).

This study measures the knowledge acquisition process as a single construct made up of two dimensions: potential and realized knowledge acquisition process. As appears in Table 3, the two dimensions

Table 2
Descriptive statistics and discriminant validity.

Constructs	Av.	SD	Correlation matrix							
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Potential knowl. acq.	4.5	1.10	0.70							
2. Realized knowl. acq.	4.9	1.03	0.46	0.76						
3. Knowl. conversion	4.7	1.05	0.46	0.64	0.82					
4. Knowl. application	5.1	1.11	0.40	0.63	0.66	0.79				
5. Organizat. agility	5.1	1.01	0.16	0.39	0.39	0.52	0.76			
6. Firm perf. 1	5.4	0.86	0.15	0.21	0.29	0.31	0.39	0.77		
7. Firm perf. 2	4.8	1.14	0.06	0.10	0.15	0.15	0.28	0.38	0.80	
8. Firm perf. 3	4.7	1.23	0.08	0.12	0.10	0.07	0.07	0.18	0.14	0.76

Av. = average score of all items included in the construct; SD = standard deviation; diagonal values in bold represent the AVE; shared variances are given in the lower triangle of the matrix.

reflect the higher-order construct. Similarly, this study operationalizes firm performance as a second-order construct consisting of three dimensions (Table 3), which correspond to three basic modes of organizational effectiveness: the open system model, the rational goal model, and the human relations model (Quinn & Rohrbaugh, 1983).

3.4. Results

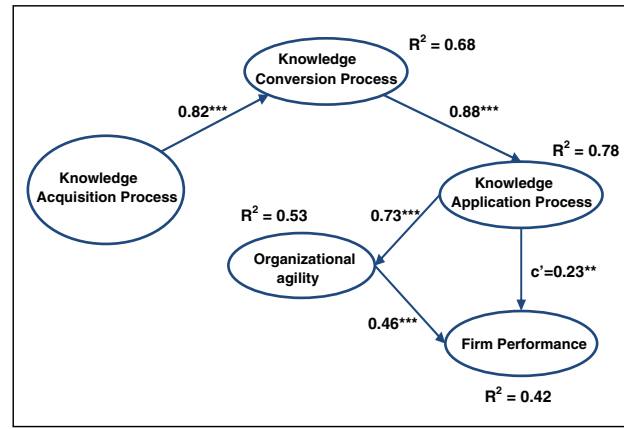
After analyzing the quality of the structural equation, the next step is to test the relations between all constructs. Consistent with Chin, Marcolin, and Newsted (2003), bootstrapping (500 subsamples) generates standard errors and t-values. Fig. 2 displays the results of hypotheses H1 (0.82, p < 0.01) and H2 (0.88, p < 0.01), showing the path coefficients along with their significance levels. The results of the statistical model offer support for both hypotheses.

Regarding hypothesis H3, this study conducts three tests to examine the mediating effect of organizational innovation: the Sobel test, the Aroian test, and the Goodman test. The three tests were all significant at the p < 0.01 level (Sobel test statistic: 3.82; Aroian test statistic: 3.82; Goodman test statistic: 3.83), thus corroborating the mediating effect. These findings support a partial mediation effect of organizational agility in the relationship between the knowledge application and firm performance, because the effect of the knowledge application process on firm performance shrinks upon the addition of organizational

Table 3
Second-order construct of knowledge acquisition and firm performance.

First-order construct	First-order			Second-order		
	Indicator	Loading	t-value	Loading	t-value	CR & AVE
Potential knowl. acquisition	PKA1	0.81	20.96	0.87	28.38	CR = 0.91 AVE = 0.53
	PKA2	0.75	14.57			
	PKA3	0.75	13.72			
	PKA4	0.77	14.48			
Realized knowl. acquisition	RKA1	0.81	22.33	0.94	101.43	
	RKA2	0.83	26.06			
	RKA3	0.79	6.78			
	RKA4	0.81	19.47			
Firm perf. 1	RKA6	0.84	23.93	0.96	107.95	CR = 0.89 AVE = 0.52
	FP1	0.84	27.72			
	FP2	0.84	25.98			
	FP3	0.82	24.01			
	FP4	0.76	14.81			
Firm perf. 2	FP5	0.84	25.19	0.72	13.07	
	FP6	0.89	37.97			
	FP7	0.93	54.52			
Firm perf. 3	FP8	0.86	30.70	0.61	8.01	
	FP9	0.88	18.73			
	FP10	0.84	18.78			

All item loadings are significant at p < 0.01. CR: composite reliability; AVE: average variance extracted.



Notes:
***<0.01; ** <0.05; * <0.1

Fig. 2. Empirical results.

agility to the model (c = 0.56, p < 0.01, while is c' = 0.23, p < 0.05). Thus, results offer partial support for hypothesis H3.

4. Discussion

This research extends the literature on knowledge management and organizational agility in two specific ways. First, this study addresses a gap in the literature and hence clarifies the interaction between knowledge processes, intermediate outcomes or mediators, and organizational performance (Lee & Choi, 2003). Second, the excellent fit of the theoretical model and the support for hypotheses H1, H2, and H3 are theoretically important findings, because they mean that organizations should consider that, in addition to developing appropriate knowledge processes to respond to volatile and dynamically changing environments, they also have to actively develop organizational agility to enhance organizational performance.

Tallon and Pinsonneault (2011) provide support for the previous ideas by suggesting that the direct effect of agility on performance is higher in volatile settings, such as the Spanish stock market during the period this study examines. Overall, this study finds support for a partial mediation of organizational agility in the relationship between knowledge application and organizational performance. The effectiveness of new organizational knowledge may depend on the agility of organizations to take advantage of opportunities and neutralize threats from the business environment.

A managerial implication derives from the fact that knowledge application can be a major driver for organizational agility, as well as an after-the-event account of the change process. This finding is important as applying knowledge to the production of goods and services can trigger new appropriate routines that support managers from reporting and dealing with strategic challenges that business leaders must tackle. One way to achieve this objective is to develop knowledge processes that allow the organization to operate in the market and adapt either directly or indirectly to market changes (Martelo & Cegarra, 2014). For example, responsiveness, common language, or shared understandings may help companies to respond to expected and unexpected changes to exploit new business opportunities (van Oosterhout et al., 2006).

5. Conclusions

The study's first contribution establishes that knowledge application and organizational agility are complementary processes. While knowledge application is a KM process that entails being successful at transferring knowledge from one context to another (Gold et al., 2001; Liao et al., 2011), applying knowledge learned to a new context may provide organizations with the ability to cope with external and internal

changes that are unpredictable and uncertain (van Oosterhout et al., 2006). In another perspective, knowledge application provides the potential for effective action (Cepeda & Vera, 2007; Wu, 2007), whereas organizational agility enhances this effectiveness (van Oosterhout et al., 2006).

The study's second contribution stresses that organizational performance strongly depends on pre-existing organizational agility and on the previous implementation of a serial linear knowledge process facilitating acquisition, conversion, and application. These findings support the views of previous researchers, who draw the attention to the fact that the existence of certain work environment characteristics might facilitate and encourage knowledge application (Gold et al., 2001; Liao et al., 2011). Through this program, organizations will be able to thrive in a continuously changing, unpredictable business environment by focusing their efforts on problems that are more important for the organization, which in turn facilitates the retrieval of appropriate prior knowledge.

The study's third contribution stresses that although the development/enhancement of knowledge application takes place after acquisition and conversion, probably knowledge application and organizational agility should be in place essentially at the same time. Arguably, organizational agility acts as a complementary capability facilitating the integration and assembly of resources, such as assets, knowledge, and relationships rather than simply the application of knowledge.

This study has some limitations that future research should consider. First, the sample the study uses is from Spain. The findings could extrapolate to other countries, because economic and technological development in Spain is similar to other OECD Member countries. Second, the study uses the key informant method for data collection. This method, while having its advantages, has also limitations because the data reflects the opinions of one person. Third, combining subjective and objective performance data for measuring organizational performance could be interesting. Future studies should take into account these suggestions to increase the validity of these findings.

A. Questionnaire items

Potential knowledge acquisition

- PKA1 Our departments interact with top management to acquire new knowledge
 PKA2 We collect information from informal means (informal meetings, talks, etc.)
 PKA3 We organize special meetings with clients to acquire new knowledge
 PKA4 Our employees meet regularly with external professionals such as consultants

Realized knowledge acquisition

- RKA1 We consider consequences of changing market demands in terms of new products
 RKA2 Our employees record and store newly acquire knowledge for future reference
 RKA3 We recognize the usefulness of new external knowledge to existing knowledge
 RKA4 We periodically meet to discuss consequences of market trends and new product
 RKA5 We clearly understand how activities should be performed
 RKA6 We constantly consider how to better exploit knowledge

Knowledge conversion

- KC1 We have processes for converting knowledge into the design of new products
 KC2 We have processes for converting competitive intelligence into plans of action
 KC3 We have processes for filtering knowledge
 KC4 We have processes for transferring organizational knowledge to individuals
 KC5 We have processes for absorbing knowledge from individuals into the organization
 KC6 We have processes for absorbing knowledge from business partners into the organ.

- KC7 We have processes for distributing knowledge throughout the organization
 KC8 We have processes for integrating different sources and types of knowledge
 KC9 We have processes for organizing knowledge
 KC10 We have processes for replacing outdated knowledge

Knowledge application

- KA1 We have processes for applying knowledge learned from mistakes
 KA2 We have processes for applying knowledge learned from experiences
 KA3 We have processes for using knowledge in development of new products
 KA4 We have processes for using knowledge to solve new problems
 KA5 We match sources of knowledge to problems and challenges
 KA6 We use knowledge to improve efficiency
 KA7 We use knowledge to adjust strategic direction
 KA8 We are able to locate and apply knowledge to changing competitive conditions
 KA9 We make knowledge accessible to those who need it
 KA10 We take advantage of new knowledge
 KA11 We quickly apply knowledge to critical competitive needs

Organizational agility

- OA1 We have the ability to rapidly respond to customers' needs
 OA2 We have the ability to rapidly adapt production to demand fluctuations
 OA3 We have the ability to rapidly cope with problems from suppliers
 OA4 We rapidly implement decisions to face market changes
 OA5 We continuously search for forms to reinvent or redesign our organization
 OA6 We see market changes as opportunities for rapid capitalization

Firm performance. 1

- FP1 We offer services of better quality
 FP2 We have more efficient internal processes
 FP3 We are more efficient with regard to the use of resources
 FP4 We have more satisfied customers
 FP5 We serve customers more quickly

Firm performance. 2

- FP6 Our company is growing more
 FP7 Our company is more profitable
 FP8 Our company is more productive

Firm performance. 3

- FP9 Our company has less staff turnover
 FP10 Our company has less staff absenteeism

Note: All questions are five-point (1–7) Likert-type scales.

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