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Knowledge management - leads to organizational performance

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ABSTRACT

The study of this paper is to estimate the impact of specific knowledge management resources (i.e. knowledge management enablers and processes) on organizational performance. The purpose of this study uses survey data from 189 managers and structural equation modelling to assess the links between specific knowledge management resources and organizational performance. The solution show that some knowledge resources (e.g. Organizational structure, knowledge application) are directly related to organizational performance, while others (e.g. technology, knowledge conversion), though important preconditions for knowledge management, are not directly related to organizational performance. The survey findings were based on a single dataset, so the same observations may not apply to other settings. The survey also did not provide in-depth insight into the key capabilities of individual firms and the circumstances under which some resources are directly related to organizational performance. The study provides to testify linking particular knowledge resources to organizational performance. Such insights can help firms' better objective their investments and enhance the success of their knowledge management initiatives. Prior research often utilizes composite measures when examining the knowledge management-organizational performance link. This bundling of the dimensions of knowledge management allows managers and researchers to focus on main effects but leaves little room for understanding how particular resources relate to organizational performance. This study addresses this gap by assessing the links between specific knowledge management resources and organizational performance. The results show that some resources are directly related to organizational performance, while others are not.

Introduction

For many organizations achieving improved performance is not only dependent on the successful deployment of tangible assets and natural resources but also on the effective management of knowledge . As such, investments in knowledge management continue to increase impressive manner from year to year. The main reasons firms invest in knowledge management is to build a knowledge capability that facilitates the effective management and flow of information and knowledge within the firm.

Different resources make up the knowledge capability of a firm. These include technology infrastructure, organizational structure and organizational culture which are linked to a firm's knowledge infrastructure capability; and knowledge learning, knowledge conversion, knowledge application and knowledge protection which are linked to the firm's knowledge process capability. Taken together, these resources determine the knowledge management capability of a firm, which in turn has been linked to various measures of organizational performance.

Given the complex nature of knowledge capabilities, most firms will possess different levels and combinations of resources (i.e. Knowledge enablers and processes) that collectively make up their knowledge capability. The contribution that each resource makes to organizational performance is therefore likely to vary across firms;it is this unique makeup that enables benefits such as competitive advantage and improved performance.

Although research suggests that a firm's knowledge management capabilities in combination, impact organizational performance, it is likely that only some of the resources that make up these capabilities will contribute to organizational performance on their own. However, prior research has tended to bundle the dimensions that make up knowledge capabilities. This approach has the advantage of enabling managers and researchers to focus on main effects, but leaves little room for understanding how particular resources relate to organizational performance. Using survey data from 189 senior- and middle-level managers in the service and manufacturing sectors and structural equation modeling techniques, it is expected that this study will provide insights into the links between individual knowledge enablers and processes, and organizational performance. The outcomes will not only provide managers and researchers with quantitative evidence linking particular knowledge resources to organizational performance. The outcomes will also address gaps in the literature regarding the lack of large-scale empirical evidence linking knowledge management to organizational performance.

For example,firms that decide to enhance their overall capabilities may start with a decision about the applications they need,then move to decisions about the infrastructure and other processes needed to support the application(e.g.how knowledge will be acquired converted and protected).Focusing on individual knowledge enablers and processes can therefore provide a more fundamental understanding of a firm's

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knowledge capabilities and enhance management decision-making at the resource level. A more detailed evaluation of the links between the individual dimensions of knowledge management capabilities and organizational performance can address this gap.

Using survey data from 189 senior- and middle-level managers in the service and manufacturing sectors and structural equation modeling techniques,it is expected that this study will provide insights into the links between individual knowledge enablers and processes and organizational performance.The outcomes will not only provide managers and researchers with quantitative evidence linking particular knowledge resources to organizational performance but will also shed light on how firms can enhance the success of their knowledge management initiatives through a more tergeted and direct approach to implementation.The outcomes will also address gaps in the litereture regarding the lack of large-scale empirical evidence linking knowledge management to organizational performance(Zack et al.,2009)

Literature review

Gold et al. (2001) proposed a model of knowledge management capabilities that has since become one of the most widely cited in the knowledge management literature. In this model, Gold et al. theorized knowledge management capabilities as multidimensional concepts that incorporate: a process perspective which focuses on a set of activities, that is knowledge process capabilities and an infrastructure perspective which focuses on enablers, that is knowledge infrastructure capabilities (Alavi and Leidner, 2001; Lee and Choi, 2003). These in turn are composed of multiple dimensions: knowledge infrastructural capability comprises technology, organizational culture and organizational structure while knowledge process capability is made up of knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection (Gold et al., 2001).

Prior research suggests these enablers and processes are necessary preconditions for effective knowledge management (Alavi and Leidner, 2001; Davenport et al., 1998). Thus most researchers using the Gold et al. framework will model the knowledge infrastructure and knowledge process capabilities as composite constructs, when examining the links between knowledge capabilities and outcomes such as organizational performance, knowledge management success, and strategy implementation.

For example, Gold et al. (2001) found that both knowledge infrastructure capability and knowledge process capability are positively related to organizational performance. This approach has the benefit of allowing researchers to focus on the main effects and enhancing parsimony.

However, what is not well known is whether there are differential relationships between the individual dimensions of knowledge process capability and knowledge infrastructure capability, and organizational performance and the nature of these relationships (Law et al., 1998; Petter et al., 2006). To address this gap, this study examines a decomposed Gold et al. (2001) model, analysing the structural model at the level of the individual resource vice versa organizational performance. The outcomes are expected to provide specific insights into the knowledge management – organizational performance link by identifying those knowledge resources (i.e. enablers and processes) that are directly related to organizational performance.

The Theoretical model

When it comes to the relationship between IT resources and organization performance the resource-based view (RBV) offers a useful lens for understanding this link. In essence, the RBV argues that "firms possess resources, a subset of which enables them to achieve competitive advantage, and a further subset which leads to superior long-term performance" (Wernerfelt, 1984, p.108). However, the RBV is void of a single definition of the term "resource" (Wade and Hulland, 2004) with many researchers "resources" and "capabilities" interchangeably (Christensen and Overdorf, 2000; Gold et al., 2001; Sanchez et al., 1996). However, Grant (1991) suggests that a firm's resource is the basic unit of analysis and provides direct input to the product process while the firm's capability represents an aggregation of resources or "the capacity for a team of resources to perform some task or activity" (Grant, 1991, p.119).

Thus "resources are the sources of a firm's capabilities, and capabilities are the main source of its competitive advantage"(Grant, 1991, p.119).Consequently,both resources and capabilities can contribute to a firm's bottom-line(Grant,1991).However,few resources are productive on their own and it is the overall capabilities that are considered the true drivers of the firm's productivity (Grant,1991).

The RBV also recognizes that while some resources may lead to performance enhancements,others do not,and that the combination may differ across industries and firms.As such,a key challenge for firms is to identify and leverage those resources that directly impact organizational performance(Wade and Huland,2004;Zack et al.,2009)

Since the aim of this research was to better understand the relationships between the individual factors that make up the firms' knowledge management capabilities and organizational performance, two levels of analysis were conducted. First, a decomposed model of knowledge management capabilities was examined – this looked at the links between organizational performance and particular resources (i.e. enablers and processes) that make up a firm's knowledge infrastructural capability and knowledge process capability. The composite model was also evaluated and the results compared with the findings from the decomposed model.

Based on this understanding of the relationship between resources, capabilities and organizational performance, the next section examines knowledge management capabilities, the resources that make up these capabilities, and the theorized links between these resources and organizational performance. A decomposed model of knowledge management capabilities is then assessed vice versa organizational performance, and the results compared with a composite model of knowledge management capabilities. Implications for future research and practice follow.

Knowledge management capability

Knowledge management supports the aggregation of resources into capabilities(Maier and Remus,2002) Knowledge management capabilities can be categorized into two broad types- Knowledge infrastructure capability and Knowledge infrastructure process capability(Gold et al.,2001)

Knowledge infrastructure capability

Prior research recognizes the importance of having a supportive and effective knowledge infrastructure to support a firm's knowledge management initiatives (Davenport and Vo¨ lpel, 2001; Paisittanand et al., 2007). Different elements make

up a firm's knowledge infrastructure capability.This study adopts the gold et al.(2001)typology which views technology organizational culture and organizational structure as key components of a firm's knowledge infrastructure capability(Davenport and Volpel,2001;Paisittanand et al.,2007)
Technology.

The technology element of knowledge infrastructure comprises the information technology (IT) systems that enable the integration of information and knowledge in the organization as well as the creation, transfer, storage and safe-keeping of the firm's knowledge resource. Although an appropriate technology infrastructure is essential for effective knowledge management,studies that examine the link between information technologies and measures of organizational performance are often inconclusive, and fail to demonstrate whether IT is directly related to performance(Powell and Dent-Micallef,1997; Webb and Schlemmer,2006).For example,Powell and Dent-Micallef(1997)in their study of US firms,found that IT in and of itself did not enhance organizational performance,but could increase organizational performance when combined with other human and business assets.Teece et al.(1997) further suggested that the absence of an associationt between technology and performance could be because technology(e.g.IS resourcas)is easily copied,making it a fragile source of competitive advantage.

Although technology is not always linked directly to organizational performance,research shows that when combined with other resources IT can enhance performance and lead to sustained advantage (Clemons and Row, 1991; Powell and Dent-Micallef, 1997). So although the technology infrastructure may not contribute directly to organizational performance,it is an essential enabler of other knowledge resources such as knowledge acquisition and knowledge application processes,which may themselves enhance organizational performance(Seleim and Khalil,2007)

Organizational culture

In the context of knowledge management is considered a complex collection of values, beliefs, behaviours and symbols that influences knowledge management in organizations (Ho, 2009). Hence, a knowledge-friendly culture is regarded as one of the most important factors impacting knowledge management and the outcomes from its use (Alavi et al., 2005-2006; Davenport et al., 1998; Ho, 2009). Sin and Tse (2000) found that organizational cultural values such as consumer orientation, service quality, informality and innovation were ''significantly associated with marketing effectiveness'' (Sin and Tse, 2000, p. 305). More recently, Aydin and Ceylan (2009) also showed that cultural dimensions were related to organizational performance.

Changes in corporate culture are also regarded as necessary for implementing knowledge management programs (Bhatt, 2001): ''the ability of an organization to learn, develop memory, and share knowledge is [therefore] dependent on its culture'' (Turban et al., 2005, p. 496). Thus, positive changes in culture are expected to impact organizational performance and add momentum to other improvements taking place elsewhere in the organization (Richert, 1999).

Organizational structure comprises the organizational hierarchy, rules and regulations, and reporting relationships (Herath, 2007) and is considered a means of co-ordination and control whereby organizational actors can be directed towards organizational effectiveness. Knowledge management theorists largely conclude that changes in an organization's structure, such as moving from hierarchical to flatter networked forms, are essential for the effective transfer and creation of knowledge in the organization (Beveren, 2003; Gold et al.,2001; Grant, 1996; Nonaka and Takeuchi, 1995). Such changes by extension have been positively associated with improved outputs in both service and financial terms (Richert, 1999).

Thus it is expected that:

H1. Technology is not (directly) related to organizational performance.

H2.Organizational culture is positively related to organizational performance.

H3.Organization structure is positively related to organizational performance.

Knowledge process capability

Gold et al. (2001) suggested that knowledge process capabilities (required for storing, transforming and transporting of knowledge throughout the organization) are needed for leveraging the infrastructure capability. Four broad dimensions are identified – ''acquiring knowledge, converting it into useful form, applying or using it, and protecting it'' (Gold et al., 2001, p. 190).

Knowledge acquisition

The term "acquisition" refers to firm's capability to identify,acquire and accumulate knowledge(whether internal or expernal)that is essential to its operations (Gold et al.,2001;Zahra and George,2002).Acquiring knowledge can involve several aspects including creation,sharing and dissemination.Knowledge creation practices were significantly related to organizational improvement.Further,when acquired knowledge is used appropriately,a significant and positive link is observed between knowledge acquisition and organizational performance(Lyles and Salk,1996;Seleim and Khalil,2007)

Knowledge conversion

Knowledge that is captured from various sources (both internal and external to the business) needs to be converted to organizational knowledge for effective utilization within the business (Lee and Suh, 2003). This conversion process, which takes place along the supply chain of data, information and knowledge, is transient in nature and so organizations must speedily convert data into information and information into organizational knowledge to maximize benefits from the conversion process (Bhatt, 2001). Thus, it is expected that the knowledge conversion process could influence performance outcomes.

Knowledge application

Bhatt(2001,pp. 72-73)stated that:"Knowledge application means making knowledge more active and relevant for the firm in creating value".For organizations to create value they need to apply knowledge to their products and services by various means such as repackaging available knowledge,training and motivating its people to think creatively,and utilizing people's understanding of the company's processes,products and services.For example,many organizations encourage organizational learning in which individuals and teams can apply the knowledge gained to initiatives'such as new product development with the ultimate aim of improved performance in areas such as "speed to market" and innovation(Sarin and McDermott,2003).Droge et al.(2003,p.544)also argues that "in the long run,firms that create new knowledge at a lower cost and more speedily that competitiors,and then apply that knowledge effectively and efficiently, will be successful at creating competitive advantage".

For knowledge to impact organizational performance it has to be used to support the firm's processes.Hence, it is through knowledge utilization that acquires knowledge can be transformed from being a potential capability into a realized and dynamic capability that impacts organizational performance (Cohen and Levinthal,1990; Seleim and Khalil,2007;Zahra and George, 2002)

Knowledge protection

Knowledge protection is necessary for effective functioning and control within organizations. This would typically include the use of copyright and patents along with information technology systems that allow knowledge to be secured by filename, user name, password and file-sharing protocols that ascribe rights to authorized users (Lee and Yang, 2000). However, knowledge protection is often challenging in part because the copyright laws that are intended to protect knowledge are limited in their treatment of the knowledge environment (Everard, 2001).

Notwithstanding such limitations,the knowledge protection process should not be abandoned or marginalized(Gold et al., 2001) and protecting knowledge from illegal and inapproprite use is essential for a firm to establish and maintain a competitive advantage(Liebeskind, 1996)Moreover,since knowledge is crucial for competitive advantage,storing and protecting knowledge is expected to create value for the organization(Lee and Sukoco,2007)

Taken altogether, it is expected that:

H4. Knowledge acquisition is positively related to organizational performance.

H5. Knowledge conversion is positively related to organizational performance.

H6. Knowledge application is positively related to organizational performance.

H7. Knowledge protection is positively related to organizational performance.

A composite model of knowledge management capabilities

There is a general consensus in the literature that knowledge management is linked to organizational performance (Gold et al., 2001:Lee nad Sukoco,2007:Liu et al., 2005:Zaim et al., 2007). For example, Gold et al. (2001) and Zaim et al (2007) showed that both knowlege infrastructure capability and knowledge process capability have a significant and positive impact on organizational effictiveness.Lee and Sukoco (2007) found that knowledge management capabilities affect innovation and organizational effectiveness Lee and Sukoco (2007)found that knowledge management capabilities affect innovation and organizational effectiveness.

Gosh and Scott(2007)also argued that knowledge infrastructural capabilities such as technology,organizational culture and organizational structure,need to correspond with knowledge process capabilities(e.g.actual flow and use of knowlwdge)in order to achieve considerable improvements in effectiveness. In assessing the relationship between knowledge management practices and performance outcomes, Zack et al. (2009) found that knowledge management practices are related to measure of organizational performance .Thus, it is expected that

H8.Knowledge infrastructural capability is positively related to organizational performance

H9. Knowledge process capability is positively related to organizational performance

Methodology

Decomposed models are used in research to examine complex structures at lower-levels of detail. Decomposed models stem from the notion that the constructs under investigation represent complex concepts that are often best represented as multidimensional in nature. These multidimensional constructs take different forms when it comes to theorizing the relationships between the construct and its sub-dimensions. One form is the aggregate construct, which typically consists of an algebraic composite of its dimensions.(Law et al., 1998) Under these conditions changes in the dimensions lead to changes in the constructs; this is similar to the relationship between a formative (causal) construct and its indicators where changes in the indicators lead to changes in the construct.(Petter et al., 2007)

The knowledge infrastructure capability and knowledge process capability(Gold et al., 2001) are examples of aggregate constructs. Since the overall construct is formed from its underlying dimensions, the dimensions need not be correlated; thus inferences drawn at higher-levels of analysis may not apply at the dimensional level. .(Law et al., 1998)For example,if there are opposing effects or null effects at the liwer-level these may be overlooked if the analysis focuses on the higher-level. Decomposed models address this problem by removing the causal structures from the aggregate construct and directly relating the individual dimensions to other constructs in the research model (Petter et al., 2007)

Since the aim of this research was to better understand the relationships between the individual factors that make up the firms' knowledge management capabilities and organizational performance, two levels of analysis were conducted. First, a decomposed model of knowledge management capabilities was examined – this looked at the links between organizational performance and particular resources (i.e. enablers and processes) that make up a firm's knowledge infrastructural capability and knowledge process capability.

The sample

To evaluate the research hypotheses, a survey was developed to capture measures of knowledge management capabilities and organizational performance. The measures consisted of multi-item constructs with four to six items. All items were assessed using seven-point Likert-type scales, anchored with ''strongly agree'' and ''strongly disagree''. Approximately 500 surveys were distributed to students enrolled in graduate MBA and MSc programs. Responses were returned by 265 (53 percent) persons, of which 189 (37.8 percent) from management-level staffs were usable.

Of these, 164 (86.8 percent) responses were from the service sector and 25 (13.2 percent) from manufacturing. Of the firms, 80.4 percent employed 50 persons or more; 65.6 percent employed 100 or more persons.

Data analysis and results

PLS-Graph 3.0 (Build 1130) and SPSS version 17.0 were used to assess the links between knowledge management capabilities and organization effectiveness, and bootstrapping (using PLS-Graph with 200 samples) used to evaluate the significance of the model paths.

First, the measurement model was assessed. Ideally, item loadings should exceed 0.707; loadings of 0.60 are also acceptable if there are additional indicators. The results showed one item measuring knowledge acquisition returned a loading of

0.40; this item was therefore excluded. Item loadings for all other constructs ranged from 0.668 to0.926 exceeding minimum thresholds (Table I).

Descriptive statistics (i.e. mean and standard deviation (SD)) for each construct are shown in Table II. Table II also shows that composite reliabilities ranged from 0.918 to 0.963 and average variance extracted (AVE) from 0.635 to 0.789 exceeding recommended cut-offs. Construct AVEs were also greater than the variance shared between the constructs (Table III) satisfying the criteria for discriminant validity.

Turning to the structural model, the results showed the decomposed model accounted for 0.754 of the variance observed for organizational performance (Figure 1). Of the knowledge infrastructural capabilities, only organizational structure (b ¼ 0.209; p # 0.05) was significant vice versa organizational performance; technology infrastructure (b ¼ 2 0.003) was not expected to be significant. Hypotheses H1 and H3 were supported. Contrary to expectation, organizational culture was not significant (b ¼ 0.055); H2 was therefore not supported.

For knowledge process capability, three processes were significant vice versa organizational performance: knowledge acquisition (b ¼ 0.146; p # 0.05), knowledge application (b ¼ 0.412; p # 0.001), and knowledge protection (b ¼ 0.148; p # 0.05); H4, H6 and H7 were supported. Knowledge conversion capability was not significant (b ¼ 0.025); H5 was not supported.

Next, latent variable scores representing the dimensions of knowledge process capability and knowledge infrastructural capability were extracted and used to assess the composite model. Consistent with recommended guidelines, indicator weights for all seven dimensions were examined (Table IV); all except knowledge conversion were significant vice versa their respective constructs at p # 0.05. However, this does not mean knowledge conversion was unimportant. Further examination of the item loadings showed the construct demonstrated 'absolute' importance when assessed independently of other indicators. The results also showed that, knowledge application was the most important of the dimensions in terms of relative importance.

The results of the structural model tests showed that the composite (second-order) model accounted for 0.748 of the variance observed for organizational performance (Table V). Consistent with expectations, knowledge infrastructural capability (b ¼ 0.251; p # 0.05) and knowledge process capability (b ¼ 2 0.639; p # 0.001) were both significant vice versa organizational performance, supporting hypotheses H8 and H9.

Finally, a summary of the results of the model tests for the decomposed model and the composite model are shown in Table V.

Hypotheses	Path	Significance
Decomposed model		
Knowledge infrastructural capability		
H1. Technology is not (directly) related to organizational performance	0.003	ns
H2. Organizational culture is positively related to organizational performance	0.055	ns
H3. Organizational structure is positively related to organizational performance	0.209	p # 0.05
H4. Knowledge acquisition is positively related to organizational performance	0.146	p # 0.05
H5. Knowledge conversion is positively related to organizational performance	0.025	ns
H6. Knowledge application is positively related to organizational performance	0.412	p # 0.001
H7. Knowledge protection is positively related to organizational performance	0.148	p # 0.05
R-Squared (R 2)	0.754	
Composite model		
H8. Knowledge infrastructural capability is positively related to organizational performance	0.251	p#0.05
H9. Knowledge process capability is positively related to organizational performance	0.639	p # 0.001
R-Squared (R 2)	0.748	

Discussion and Implications

Consistent with expectations, the study results provided strong empirical support for the decomposed model, accounting for 0.754 of the variance observed for organizational performance. For the composite model (Table V), the amount of variance explained was 0.748, and was similar to the decomposed model. The links between organizational performance and knowledge process capability and knowledge infrastructure capability returned path weights of 0.251 and 0.639 respectively. Altogether, these findings are consistent with prior research that has observed similar orders of magnitude for the path weights and variance explained in respect of knowledge management and organizational performance. The results for the decomposed model (Table V) showed that of the three infrastructural capabilities, only organizational structure had a significant impact on organizational Performance; neither technology nor organizational culture had a significant impact on organizational performance. For knowledge process capability, knowledge acquisition, knowledge application and knowledge protection also impacted organizational performance, but not knowledge conversion.

Altogether, these results suggest that although the individual resources collectively determine the knowledge management capabilities construct, not all are directly linked to organizational performance. This is consistent with the resource-based view which suggests that only a subset of a firm's capabilities when leveraged appropriately reflect direct contributions to performance measures.

The study results have several implications for knowledge management in firms. For example, research suggests appropriate investments in knowledge management initiatives can enhance organizational performance. However, this study shows that not all of the resources are direct contributors. Although resources such as technology, culture and knowledge conversion are necessary for effective knowledge management they did not impact organizational performance directly. However, firms can ill afford to neglect these dimensions as they work in combination with and support other resources, such as knowledge acquisition and knowledge application that may contribute directly to organizational success.

Conclusion

The literature is replete with studies that suggest knowledge management impacts organizational performance. However, there has been little elaboration of the relationships at the dimensional level vice versa organizational performance. Yet when it comes to making decisions about a firm's knowledge capability, these are often made at the level of the individual resource. This study addresses this gap by assessing a decomposed model of knowledge management capabilities. The aim was to provide insights into the relationships between particular knowledge resources and organizational performance that can help firms identify appropriate strategies for investing in and effectively deploying the knowledge resource.

Finally, research into the links between knowledge capabilities and organizational performance, and for large-scale empirical evidence supporting these links .This study addresses this call by examining the links between the individual dimensions of knowledge capabilities and organizational performance. However, other success factors such as user satisfaction and perceived benefits can also be explored.

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Table I Item loadings

Constructs	Item loadings
Technology (TC)	
TC05	
TC06	0.926
TC07	0.919
TC09	0.898
Organizational culture (CU)	
CU02	0.770
CU04	0.804
CU09	0.841
CU10	0.844
CU13	0.798
Organizational structure (ST)	
ST04	0.855
ST05	0.782
ST06	0.668
ST07	0.846
ST10	0.736
ST11	0.860
Knowledge acquisition (AQ)	
AQ03	0.806
AQ05	0.866
AQ08	0.854
AQ12	0.857
Knowledge conversion (CN)	
CN04	0.881
CN05	0.849
CN08	0.885
CN09	0.905
CN10	0.870
Knowledge application (AP)	
AP04	0.923
AP05	0.895
AP06	0.896
AP07	0.901
AP08	0.907
AP10	0.844
Knowledge protection (PT)	
PR02	0.876
PR03	0.888
PR04	0.853
PR07	0.860
PR08	0.753
PR10	0.825
Organizational performance (OP) OP01	
OP07	0.898
OP08	0.896
OP12	0.906
OP13	0.865
OP14	0.890

Table II

Z	Mean	SD	CR	AVE
Knowledge infrastructure capabilitiesanizational structure (ST) Organizational culture (CU)	5.215	1.378	0.918	0.651
Technology (TC)	4.569	1.646	0.921	0.747
Knowledge process capabilities Knowledge conversion (CN)	4.929	1.384	0.950	0.759
Knowledge application (AP)	5.140	1.447	0.963	0.789
Knowledge protection (PT)	4.930	1.473	0.948	0.725
Organizational performance (OP)	4.810	1.478	0.951	0.763

Table III Inter-construct correlations and discriminant validity

Constructs	ST	CU	TC	AQ	CN	AP	PT	OP
Knowledge infrastructure								
Organizational culture (CU)	0.745	0.807						
Technology (TC)	0.557	0.481	0.864					
Knowledge process								
Knowledge conversion (CN)	0.720	0.748	0.636	0.737	0.871			
Knowledge application	0.715	0.754	0.604	0.724	0.813	0.888		
Knowledge protection	0.595	0.591	0.600	0.588	0.641	0.642	0.851	
Organizational performance (OP)	0.742	0.723	0.576	0.718	0.752	0.822	0.669	0.873

Note: Italicizeditems represent the square-root of the variance shared between the constructs and their measures; the off-diagonal elements are the correlations among the constructs

Table IV Indicator weights and significance levels

Construct	Weight	t-statistic	Significance
Organizational structure	0.457	3.991	p # 0.001
Organizational culture	0.440	3.966	p # 0.001
Technology	0.252	3.455	p # 0.001
Knowledge acquisition	0.210	2.222	p # 0.05
Knowledge conversion	0.122	1.105	ns
Knowledge application	0.572	6.464	p # 0.001
Knowledge protection	0.213	2.792	p # 0.05