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STRATEGIC ORIENTATION OF KNOWLEDGE MANAGEMENT AND INFORMATION TECHNOLOGY AND THEIR EFFECTS ON PERFORMANCE

Yue-Yang Chen
I-Shou University, ray@isu.edu.tw

Hui-Ling Huang
Chang Jung Christian University, ling@mail.cjcu.edu.tw

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Yue-Yang Chen, Department of Business Administration, I-Shou University, Kaohsiung, Taiwan, R.O.C., ray@isu.edu.tw

Hui-Ling Huang, Department of Business Administration, Chang Jung Christian University, Tainan, Taiwan, R.O.C., ling@mail.cjcu.edu.tw, corresponding author

Abstract

Recently, a great number of theoretical frameworks have been proposed to develop the linkages between knowledge management (KM) and organizational strategy. While there has been much theorizing and case study in the area, validated research models integrating KM strategy and information technology (IT) strategy for empirical testing of these theories have been scarce.

It is though that the rapid progress of IT has been provided a good solution to support KM practices. Choosing the proper ITs to fit with different KM strategies is critical for organizations. Effective KM activities require employing KM strategies, as well as IT, appropriately. That is, as long as the KM strategy has been determined within an organization, the IT strategy must be followed. In this present research, we try to develop and examine a research model for explaining the relationships between KM strategy, IT strategy, and their effects on performance. Empirical data for hypotheses testing are collected from top-ranked companies in Taiwan; yielding 161 valid samples. The findings showed that KM strategy has a positive direct effect upon IT strategy; KM strategy and IT strategy have significant positive effects upon KM performance and IT performance respectively, and then collectively, have impact upon business performance. Finally, from the empirical data analysis, meaningful findings and conclusions are derived, and suggestions for future research are proposed and discussed.

Keywords: Knowledge management strategy, Information technology strategy, Knowledge management Performance, Information technology performance.

1 INTRODUCTION

In the unpredictable and turbulent business operational environment, firms are facing severe challenges in the global environment. Thus, it is critical for a business to acquire various kinds of skills and capabilities that are valuable, rare, and difficult to imitate or substitute (Barney 1986; 1991). According to this, the integration of firm's various kinds of advantaged weapons that are costly-to-copy is seen as the vital work for business to achieve higher operations performance (Barney 1991; Conner 1991; Schulze 1992).

Now, knowledge has been considered as an important resource than other physical assets (e.g., land, capital and machines) (Drucker 1993) which enables organizations to achieve faster learning and develop better decision-marking processes. In this complicating and rapidly changing business environment, therefore, Knowledge management (KM) is the organizational potential strategic resource and critical strategy to achieve sustainable competitive advantage (Alavi & Leidner 1999; Davenport & Prusak 1998; Grant 1996; Johannessen & Olsen 2003; Zack 1999a).

Recently, the critical roles of information technology (IT) and information system (IS) in supporting KM practices have also been indicated and examined (e.g., Alavi & Leidner 2001; Choi & Lee 2002; Kankanhalli et al. 2003; Nonaka & Konno 1998; Tiwana 2012; Zack 1999b). Thus, many firms have spent a vast amount of IT/IS resources in order to improve their KM performance because IT/IS has its ability to support connection, collaboration, communication, and form virtual knowledge communities in helping staff's learning (Alavi et al. 1997, Kim 2001). As Ruggles (1998) argued, creating an intranet, data warehousing, knowledge repositories, expert maps, decision-support tools, groupware are ways to support KM. Additionally, many enterprises start using modern IT/IS (e.g., artificial intelligence systems, office automations systems, knowledge management systems...etc.) to support capturing, storing, retrieving, and distributing of their explicitly documented knowledge (Zack 1999a). Another tools including e-mail system, on-line discussion networks, videoconferencing...etc. which provided by IT for KM, involves helping to connect experts in the organization (Scheepers et al. 2004).

From the foregoing discussions, at least two research themes may increase knowledge in this area. First, one can examine the alignment effects between IT design and KM (e.g., Baloh 2007; Chen et al. 2012, Chen & Huang 2012). Its underlying notion is that owing to the complexity of KM initiatives and the various kinds of IT techniques developed, businesses must pay more attention to implementing IT infrastructure to support their KM initiatives (Dulipovici & Robey 2013; Kankanhalli et al. 2003). Thus, the match mechanism of IT and KM is an important concern for firms. Second, developing better understanding about the cause-and-effect between IT use and KM

Therefore, this study focused on providing empirical evidence of the relationship between knowledge management (KM) strategy and information technology (IT) strategy. We posit that performance variables including business performance, KM performance, and IT performance are affected by these two strategies respectively. This paper is organized as follows. First, the concept of KM strategy and IT strategy will be discussed, following by the hypotheses development and conceptual research model. The development of research measurement items and data collecting methods then will be outlined. This will be followed by data analysis. Finally, key findings and implications will be highlighted, followed by a discussion of research limitations, suggestions for future research, and conclusions.

2 LITERATURE REVIEW

2.1 KM Strategy and KM Performance

Since knowledge has been regarded as a strategic resource for organizations (Abou-Zeid 2003; Choi & Lee 2002; Conner & Prahalad 1996; Kogut & Zander 1992), it is important to know how to effectively manage other resources (e.g., people, process, IT) to comply with knowledge. KM strategy is the right tool to determine how to employ these various resources to enhance knowledge quantity and quality, thus, are regarded as the facilitators for KM outcomes (Beckman 1999; Hansen et al. 1999, Zack 1999a).

Various KM strategies development are classified by the nature of knowledge itself, (e.g., explicit or tacit) (Shih & Chiang 2005; Polanyi 1997). Explicit knowledge refers to transfer information in a systematized manner, whereas tacit knowledge refers to transfer information through social networks among employees. These two concepts are similar to that of Hansen et al.'s (1999) classification for KM strategy as "codification strategy" which is also called "system strategy" and "personalization strategy" which is also called "human strategy" respectively. While codification strategy of KM adopted, it seeks to retrieve and store knowledge in explicit form (e.g., in information systems or databases) that can be easily transferred and reused by individuals in an organization. The personalization strategy of KM, on the other hand, seeks to capture and share tacit knowledge that resides in human minds, behavior, and perception. It evolves from person-to-person interact extensively to obtain knowledge. In other words, various IT strategies for firms must to support for the adoption of different KM strategies.

The rapid progress of IT provides a good solution to answer the question: why does a KM project alone not always lead to enhanced business performance when firms overlook its links to other resources? That is, firms with excellent IT capabilities allow them to cope with the present competitive and dynamic environment well (Bhatt & Grover 2005). Accordingly, strategic IT management has been regarded an enabler in business performance, when it fits with certain aspects of the KM context, helping companies to survive in the highly-competitive business environment (Alavi & Leidner 2001).

Choosing the right ITs for different KM strategies is critical for organizations (Kim 2001). Effective KM activities require employing KM strategies, as well as IT, appropriately (Mahapatra & Sarkar 2000). Using various IT solutions to comply with KM strategy will contribute to the creation of corporate knowledge directories, via knowledge mapping or the building of knowledge networks (Wakefield 2005). Therefore, the relationship between KM strategy and IT strategy is highly relevant (Fehér 2002). Meanwhile, according to the arguments presented by Asoh (2004), as an enabler for KM and IM/IS, IT strategy serves as the delivery-oriented component (Earl 1989) that must be aligned with KM strategy to improve both KM and organizational performance. In the context of the KM development environment, higher KM capability requires a high quality of IT relatedness, which, in turn, depends upon how well their relationships have been modeled (Tanriverdi 2005; Sher & Lee 2004; Tippins & Sohi 2003; Gold et al. 2001; Grover & Davenport 2001). It means that an organization's KM strategy should provide direction in determining how IT can support knowledge activities within the organization (Scheepers et al. 2004; Earl 2001; Davenport et al. 1996).

IT strategy can be classified into two general categories: IT environment scanning; and strategic use of IT (Bergeron et al. 2004). System KM strategy requires IT tools that allow for explicit knowledge to be formalized and articulated in documents, and shared electronically through IT infrastructures such as intranets (Scott 1998). In this manner, organizations should invest in an extensive IT system to codify knowledge. Therefore, a firm's IT strategy should focus on paying more attentions to strategic use of IT internally, in order to improve the quality and quantity of electronic repositories or databases. In contrast, human KM strategy draws upon interpersonal relationships to exchange and share tacit knowledge across the organization. Thus, firms need a moderate investment in IT to connect experts in the organization. The technologies may include an e-mail system, on-line discussion networks, videoconferencing, and other collaborative tools (Scheepers et al. 2004). A firm's IT strategy, therefore, should aim at scanning the external IT environment, searching for communication tools and other interactive technologies to support person-to-person knowledge-sharing.

Accordingly, a right IT strategy used will depend upon what KM strategy an organization employed. Hence, the following hypothesis is proposed:

H1: KM strategy has a positive direct effect on IT strategy.

According to the perspectives of explicit-oriented and tacit-oriented, Choi and Lee (2003) classified KM methods into four styles, labeled dynamic, system-oriented, human-oriented, and passive. After empirical test from 54 Korean firms in the manufacturing, service, and financial industries, they indicate that dynamic style integrating explicit-oriented with tacit-oriented methods is found to have a significant impact on performance. On the case study of 31 different KM projects in 23 countries, Davenport and Prusak (1998) propose a four KM projects typology, namely knowledge repositories, knowledge access, knowledge environment, and knowledge assets. They further manifest the factors that lead to successful KM projects, including knowledge-oriented culture, technical and organizational infrastructure, senior management support, clarity of vision and language, linking KM to economic benefits, nontrivial motivational aids, multiple channels for knowledge transfer, and the level of knowledge structure. Finally, in a survey of 32 KM professionals, Singh (2000) indicates that the activities of KM value chain, including five primary knowledge activities (i.e., acquisition, selection, generation, integration, and externalization) and four secondary activities (i.e., leadership, coordination, control, and measurement), were found to have a positive relationship to competitive advantages in terms of perceived productivity, reputation, agility, and innovation. In sum, much evidences have been proved that develop a KM strategy provides a valuable opportunity to obtain a greater understanding of the way a business operates to foster their KM practices to success (Garavelli et al. 2004; Robertson 2004). Consequently, the following hypothesis is proposed:

H2: KM strategy has a positive direct effect on KM performance.

It has been realized that successful KM projects will lead to overall organizational performance (Davenport & Prusak 1998; Argote & Ingram 2000). However, such linkage is indefinite and difficult to validate clearly (Yu et al. 2004). That is, it means that there is still an unexplored evidence to prove the direct relationship between knowledge-related antecedents and organizational performance, since lots of factors may contribution to the organizational performance (Lee & Choi 2003; Ostroff & Schmitt 1993). As Lee and Choi (2003) describe “this incorporation may help confirm that enablers ultimately create business value.” (p. 182). Thus, an intermediate outcome (e.g., knowledge quality, user knowledge satisfaction, or organizational creativity) may be introduced as a mediator in the causal relationship (Lee & Choi, 2003, Yu et al. 2004).

H3: KM performance has a positive direct effect on business performance.

2.2 IT Strategy and IT Performance

IT strategy is concerned with technology policies including questions of architecture, security levels, etc. (Earl 1989). In Henderson and Venkatraman’s (1993; 1999) strategic alignment model, IT strategy involves three components that should be articulated in terms of internal and external domains: information technology scope, systemic competencies, and IT governance. In the perspective of information-processing requirements, IT strategy has been conceptualized as a four-dimensional construct, namely competencies, role of IT, systems design and development, and infrastructures (Das et al. 1991). According to Bergeron et al. (2004), two dimensions are identified within IT strategy, the first one is IT environment scanning, representing the capability of a firm to detect and react to external changes in technology; the second one is strategic use of IT, representing what extent a firm used IT to increase product quality and performance. In Earl’s (1989) research, he contends that there are three levels of IS-related strategy, labeled IM (information management) strategy, IS (information system) strategy, and IT (information technology) strategy, wherein IT strategy deals with the technology used for delivery of application systems and has been defined as “the portion of an organization’s overall strategy that related to the IT groups.” (Blanton et al. 1992, p. 535).

Numerous of successful stories involving strategic utilization of IT have been described in the literature (Sabherwal & Grant 1994). While many researchers have indicated that IT has a significant positive direct effect on organizational outcome, however, enough of exceptions have been argued to contest with the argumentation (Barua & Lee 1997; Markus & Soh 1993; Quinn & Baily 1994; Clemons & Row 1991). This premise is similar to the influential processes of KM process-KM intermediate outcome-organizational performance aforementioned. As Henderson and Venkatraman (1993) contend “Indeed, the key strategic IT management challenge lies in the identification of those strategic dimensions that require modification under different contingencies for enhancing organizational performance”. It means that IT strategy should be aligned with its business strategy or other meaningful activities, thus, the direct maximum effectiveness for organizations can be achieved, or the performance would be formed by an indirect effect form IT strategy to business performance through IT outcome.

H4: IT strategy has a positive direct effect on IT performance.

H5: IT performance has a positive direct effect on business performance.

Furthermore, numerous of studies have pointed out that suitable or successful IT implementations are enablers for effective KM activities (Alavi & Leidner 2001; Choi & Lee 2002; Kankanhalli et al. 2003; Nonaka & Konno 1998, Zack 1999b). It means that for achieving KM performance requires IT deployment well to enhance the KM outcome (Mahapatra & Sarkar 2000). Thus, the following hypothesis is also proposed:

H6: IT performance has a positive direct effect on KM performance.

3 METHODOLOGY

3.1 Measurement Development

Five constructs were measured in this study, including KM strategy, IT strategy, KM performance, IT performance, and business performance. A multiple-item method was used to form the questionnaires. Each item was used in 7-point Likert scales, ranging from “1 = strongly disagree” to “7 = strongly agree”. Wherever possible, for the measurement validity, this study adopted well-established research instruments, with only minor changes in wording. Most of the independent and dependent variables were operationalized, based upon the pertinent existing literature.

3.1.1 KM Strategy

Researchers contend that KM strategy is different from knowledge strategy (Asoh 2004, Zack 2002). Knowledge strategy is operationalized as “knowledge-related guidelines on what individuals or groups of individuals know or need to know, and on how to develop and deploy the required knowledge to ensure organizational objectives.” (Asoh 2004, p. 72). Then, KM strategy in our study is defined as “the set of tactical and/or operational activities executed by an organization in response to its knowledge strategy.” According to Hansen et al. (1999), KM strategy includes two components: system strategy and human strategy. We measure it using 8 items adapted from Choi and Lee’s (2002) instrument and Hansen et al.’s (1999) classification. The original items are listed in Table 1.

Construct	Item
System	kss1: In my organization, our knowledge (know-how, technical skill, or problem solving methods) is well codified. kss2: In my organization, our knowledge can be acquired easily through formal documents and manuals. kss3: In my organization, results of our projects and meetings should be documented.

	kss4: In my organization, our knowledge is shared in codified forms like manuals or documents.
Human	ksh1: In my organization, our knowledge can be easily acquired from experts and co-workers. ksh2: In my organization, it is easy to get face-to-face advice from experts. ksh3: In my organization, informal dialogues and meetings are used for knowledge sharing. ksh4: In my organization, our knowledge is acquired by one-to-one mentoring.

Table 1. Items measures of KM strategy

3.1.2 IT Strategy

IT strategy is defined as "the portion of an organization's overall strategy that relates to the IT group" (Blanton et al. 1992). It includes two dimensions: IT environment scanning, representing the extent the firm's capability to detect and react to technological changes relative to its competitors; and strategic use of IT, representing the extent to which firms use IT to improve their productivity, profitability, quality and performance (Bergeron et al. 2004). The present investigators measured IT strategy using 11 items, which are listed in Table 2.

Construct	Item
IT environment scanning	iye1: In my organization, we use an external information network to identify our requirements in information technology. iye2: In my organization, we know the information technology used by our competition. iye3: In my organization, we institute a technology watch in order to rapidly change our information technology when necessary. iye4: In my organization, we ensure that our choice of information technology follows the evolution of our environment. iye5: In my organization, we use the information technologies that will permit a rapid reaction to environmental pressure.
Strategic use of IT	iyu1: In my organization, we use IT to reduce our production costs. iyu2: In my organization, we use IT to generate substantial savings. iyu3: In my organization, we use IT to improve our firm's productivity. iyu4: In my organization, we use IT to increase our firm's profitability. iyu5: In my organization, we use IT to improve the quality of products or services. iyu6: In my organization, we use IT to respect the deadlines requested by our customers.

Table 2. Items measures of IT strategy

3.1.3 KM Performance

KM performance is defined as "the measures of knowledge quality and user satisfaction of the firm through its business endeavours and deployment of KM resources." As knowledge-based view of a company has emerged as an important issue in strategic management researchers and practitioners, it is important to know how to develop appropriate metrics to assess the effectiveness of KM (Chen & Chen 2006; Lee et al. 2005; Ahn & Chang 2004; Schultze & Leidner 2002). According to a literature review from 1995 to 2004, Chen and Chen (2006) point out that although quantitative analysis is the primary methodology used to evaluate KM performance, it demonstrates a tendency toward using non-financial factors (subjective perceptions) for KM performance assessment in a social and behavioral sciences approach. Thus, we adopt this argument by using subjective measures to evaluate KM performance.

The instrument is adopted from that of Yu et al.'s (2004) well-defined measures. It is composed of 10 items which fall into two dimensions: knowledge quality (5 items) and user knowledge satisfaction (5 items). The original items are listed in Table 3.

Construct	Item
Knowledge Quality	Knowledge provided by a knowledge management system … kql1: is relevant to our business and tasks. kql2: is comprehensive so that it can cover all contents required by our business and tasks. kql3: is reliable. kql4: is accurate. kql5: is of good quality on the whole.
User Knowledge Satisfaction	I am satisfied with … uks1: the quality and quantity of knowledge available at the KM system. uks2: the capability with which I can search and obtain knowledge necessary to me. uks3: various functions provided by the KM system. uks4: the evaluation and reward systems in knowledge management. uks5: organizational management of knowledge.

Table 3. Items measures of KM performance

3.1.4 IT Performance

IT performance is defined as "the measures of user satisfaction and organizational impact of the firm through its business endeavours and deployment of IT resources." Eight items were used to measure IT performance. The measure was derived from the survey research that Chan et al. (1997) and Powell and Dent-Micallef (1997) used. We employed two key dimensions as the proxies for measuring IT performance. The first one is user information satisfaction (3 items), which is a short form for the user information satisfaction (UIS) instrument with minor change to comment on their satisfaction with company systems. The second one is IT organizational impact (5 items) designed to measure respondents' perceptions about the impacts on business productivity, competitive position, and financial performance, as well as the overall performance. The original items are listed in Table 4.

Construct	Item
UIS	itu1: I am satisfied with IS/IT staff and services. itu2: I am satisfied with the information product. itu3: I am satisfied with end user knowledge.
Organizational impact	ito1: IT has dramatically increased our productivity. ito2: IT has improved our competitive position. ito3: IT has dramatically increased our sales. ito4: IT has dramatically increased our profitability. ito5: IT has improved our overall performance.

Table 4. Items measures of IT performance

3.1.5 Business Performance

Since conceptualization and operationalization of business performance is a difficult issue in strategy research (Venkatraman & Ramanujam 1986), strategic management and IS/IT researchers have offered a variety of measures of organizational performance. Dess and Robinson (1984) argue that, while measuring organizational performance, the subjective approach and the objective approach produce similar results. According to Khandwalla (1977), subjective measures are widely used instead of objective measures, because subjective measures have been shown to capture a broad concept like business performance. In the IS/IT research, several studies (e.g., Croteau & Raymond 2004; Chan et al. 1997; Bergeron & Raymond 1995; Venkatraman 1989) have used the subjective approach successfully to investigate the relationship between strategy and business performance. Consequently, this study employs subjective measures of business performance.

Business performance is defined as 'the measures of growth and profitability of the firm through its business endeavors and deployment of organizational and technology resources'. It is operationalized using Venkatraman's (1989) instrument and measured from a multi-dimensional perspective. Of 9 items involving 7-point Likert scales, respondents were asked to indicate their perceptions of how their firm performs relative to the main competitor in the market on three dimensions (i.e., growth, profitability, and overall performance) in term of sales growth rate, market share gains, ROI, net profit, return on sales, and financial liquidity. An additional item examining the overall operational performance of the respondent's firm also was included. Table 5 lists the original business performance items used in our research.

Construct	Item
Growth	opg1: The sales growth position has been outstanding relative to competition. opg2: The sales growth has been outstanding relative to competition. opg3: The market share gains have been outstanding relative to competition.
Profitability	opp1: The return of corporate investment has been outstanding relative to competition. opp2: The net profit position has been outstanding relative to competition. opp3: The ROI position has been outstanding relative to competition. opp4: The return on sales has been outstanding relative to competition. opp5: The financial liquidity position has been outstanding relative to competition.

Table 5. Items measures of business performance

3.2 Pretest

The initial version of this instrument was pretested for content validity using samples of two MIS professors and five experts in the KM field. Participants were asked to examine the survey instruments and comment on its format and length, as well as on the wording of each individual item. Ambiguous items were reworded, based upon participant feedback.

3.3 Unit of Analysis

In survey research, distributing the questionnaire to the right person is critical. The unit of analysis in our research was an organization or strategic business unit (SBU). Respondents needed to be knowledgeable about the nature of their KM activities, IT deployment and performance of KM, IT, and business. Thus, executives (CIO, CEO, CKO, Directors) and those who were responsible for devising KM within a command tent were felt to be the right individuals to answer our questionnaire.

3.4 Data Collection Procedure

We used a cross-sectional mailed survey for data collection. Mailing lists were excerpted from the 2010 Common Wealth Magazine database, which includes the top 1000 companies in the manufacturing industry, the top 500 companies in the service industry, and the top 100 companies in the finance/banking industry in Taiwan. The reason we chose the top companies in each industry was that they are the best performing companies in Taiwan. We were interested in finding out the prevalence of KM strategic alignment in successful companies.

4 DATA ANALYSIS AND RESULTS

4.1 Sample Characteristics

The characteristics of the sample are shown in Table 7. The largest number of respondents came from the manufacturing industry, representing 57.1 percent of the responding companies. The largest share of the companies had 100 to 499 employees (37.9%). Even though the questionnaires were sent to executive officers, the respondents held various job titles, including top manager, middle manager, and first-line manager, among others. Approximately 60% of the respondents had more than 6 year's experiences within the current firm. This suggests that the respondents had enough experience and knowledge to complete the questionnaire. The largest proportion (47.2%) had an undergraduate degree. The age of the participants ranged from 21 to 51 and above, with the largest percentage (39.8%) in the 31 to 41 category. About 75% of the respondents were male.

4.2 Descriptive Statistics

The means, standard deviations, and matrix of intercorrelations among the variables are shown in Table 6. The correlation matrix indicates that both growth and profitability business performance were highly correlated with all KM strategy (system and human), IT strategy (IT environment scanning and strategic use of IT), KM performance variables (knowledge quality and user knowledge satisfaction), IT performance (user information satisfaction and organizational impact). It also indicates that the independent variables were significantly inter-correlated, at the $p<0.01$ level.

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9
1. kss	4.84	0.85									
2. ksh	4.70	0.83	0.68								
3.iye	5.01	0.89	0.54	0.61							
4. iyu	5.14	0.88	0.62	0.61	0.72						
5. kql	4.73	0.86	0.59	0.50	0.58	0.61					
6. uks	4.53	0.87	0.62	0.56	0.58	0.65	0.82				
7. itu	4.84	0.90	0.49	0.56	0.61	0.61	0.57	0.68			
8. ito	4.75	0.98	0.46	0.51	0.60	0.69	0.56	0.67	0.75		
9. opg	4.49	1.06	0.39	0.44	0.33	0.38	0.40	0.49	0.44	0.45	
10. opp	4.42	1.04	0.42	0.44	0.31	0.39	0.40	0.48	0.44	0.47	0.87

Note: 1. n=161.
2. All correlations are significant at the $p < 0.01$ level (2-tailed).
3. kss: system; ksh: human; iye: IT environment scanning; iyu: strategic use of IT; kql: knowledge quality; uks: user knowledge satisfaction; itu: user information satisfaction; ito: organizational impact; opg: growth; opp: profitability.

Table 6. Descriptive statistics and intercorrelations

4.3 Assessment of Construct Validity

A Structural Equation Modeling with the PLS (Partial Least Square) technique was used to assess the measurement model. The validity of the research constructs was assessed using estimation and respecification of the measurement model by confirmation factor analysis (CFA).

The important step in scale validation is to assess the strength of measurement between the items and associated constructs. In the estimated model, items that demonstrate cross load, poor loadings and poor reliability were dropped and the model was re-estimated. This was done to ensure that data are a good fit with the measurement. We used the value of 0.5 as the threshold for factor loading assessment (Hair et al. 2006). As a result (see Table 7), ksp4 was deleted because of the poor loadings to explain its underlying construct. After dropping this item, the CFA model is re-estimated again to ensure that data are a good fit with the measurement model.

In addition, to cross-validate these constructs, other methods were used to reconfirm the construct validity and reliability. According to Bagozzi and Yi (1988) and Fornell and Lacker (1981), a perfect measurement model for research must satisfy three types of reliability: (1) individual item reliability should be as large as possible; (2) reliability for the composite of measurements of a latent variable should exceed 0.6; and (3) the average variance extracted (AVE) from a set of measurements of a latent variable should exceed 0.5. Furthermore, the value of AVE can also be used to discern convergent validity (Fornell & Larcker 1981; Hair et al. 2006). Table 7 illustrates that the values of individual item reliability and composite reliability of the constructs are all adequate. Variance extracted estimates, as discussed by Fornell and Larcker (1981), were used to assess the average variance extracted for all constructs, suggesting that a value of 0.5 or larger is adequate. As we can see in Table 7, the values of AVE for all constructs are ranging from 0.74 to 0.92 demonstrating a reasonable degree of convergent validity.

Construct indicators	Standardized loadings[1]	Standard Error	T value	IIR[2]	CR[3]	AVE[4]
KM strategy						
System	0.89	0.011	44.22	0.79	0.93	0.77
kss1	0.86	0.022	39.81	0.74		
kss2	0.89	0.020	43.95	0.79		
kss3	0.84	0.029	28.85	0.71		
kss4	0.91	0.015	61.40	0.83		
Human	0.94	0.020	88.87	0.88	0.91	0.76
ksp1	0.89	0.018	49.76	0.79		
ksp2	0.91	0.015	61.29	0.83		
ksp3	0.82	0.036	22.92	0.67		
IT strategy						
IT environment scanning	0.91	0.014	66.86	0.83	0.94	0.74
iye1	0.81	0.037	21.54	0.66		
iye2	0.80	0.040	19.82	0.64		
iye3	0.90	0.016	55.21	0.81		
iye4	0.90	0.018	49.75	0.81		
iye5	0.88	0.024	36.74	0.77		
Strategic use of IT	0.94	0.008	119.09	0.88	0.95	0.77
iyu1	0.89	0.018	49.28	0.79		
iyu2	0.86	0.030	28.11	0.74		
iyu3	0.90	0.019	46.40	0.81		
iyu4	0.88	0.029	30.12	0.77		
iyu5	0.88	0.022	38.77	0.77		
iyu6	0.85	0.035	24.15	0.72		
KM performance						
Knowledge quality	0.96	0.010	97.79	0.92	0.95	0.80
kql1	0.84	0.031	26.65	0.71		
kql2	0.88	0.029	29.99	0.77		
kql3	0.93	0.016	56.02	0.87		
kql4	0.94	0.013	71.44	0.88		
kql5	0.88	0.024	36.20	0.77		
User knowledge satisfaction	0.96	0.007	127.97	0.92	0.95	0.80
uks1	0.92	0.019	45.29	0.85		
uks2	0.79	0.037	21.01	0.62		
uks3	0.93	0.015	60.64	0.87		
uks4	0.91	0.018	49.26	0.83		
uks5	0.92	0.013	73.60	0.85		
IT performance						
User information satisfaction	0.90	0.016	57.77	0.81	0.95	0.86
itu1	0.90	0.022	41.82	0.81		
itu2	0.96	0.008	121.02	0.92		
itu3	0.92	0.016	55.87	0.85		
Organizational impact	0.96	0.006	161.39	0.92	0.97	0.85
ito1	0.92	0.013	68.66	0.85		
ito2	0.94	0.009	96.89	0.88		
ito3	0.95	0.011	86.56	0.90		
ito4	0.93	0.011	84.09	0.87		
ito5	0.87	0.039	22.48	0.76		
Business performance						
Growth	0.95	0.007	130.04	0.90	0.97	0.92
opg1	0.96	0.017	94.50	0.92		
opg2	0.97	0.011	214.89	0.94		
opg3	0.94	0.010	94.84	0.88		
Profitability	0.98	0.003	302.08	0.96	0.97	0.85

Construct indicators	Standardized loadings[1]	Standard Error	T value	IIR[2]	CR[3]	AVE[4]
opp1	0.92	0.016	57.54	0.85		
opp2	0.96	0.009	103.62	0.92		
opp3	0.95	0.009	106.19	0.90		
opp4	0.96	0.007	129.31	0.92		
opp5	0.82	0.039	21.20	0.67		

Note:
[1] All item loadings (λ) are significant at $p < 0.05$ level
[2] Individual item reliability (IIR) = (Standardized loadings)^2
[3] Composite reliability (CR) = (ΣLi)2/((ΣLi)2+ΣVar(Ei))
[4] Average variance extracted (AVE) = ΣLi2/(ΣLi2+ΣVar(Ei))

Table 7. Scale properties for the measurement model

Finally, discriminant validity was assessed by the variance extracted test proposed by Fornell and Larcker (1981). As can be seen in Table 8, square root of variance extracted estimates for any pair of two factors was compared to the correlation between the two constructs. If both variance extracted estimates are greater than the squared correlation, then discriminant validity is demonstrated. The results of the variance extracted tests show that discriminant validity is supported, since each squared correlation is less than both applicable variance extracted estimates.

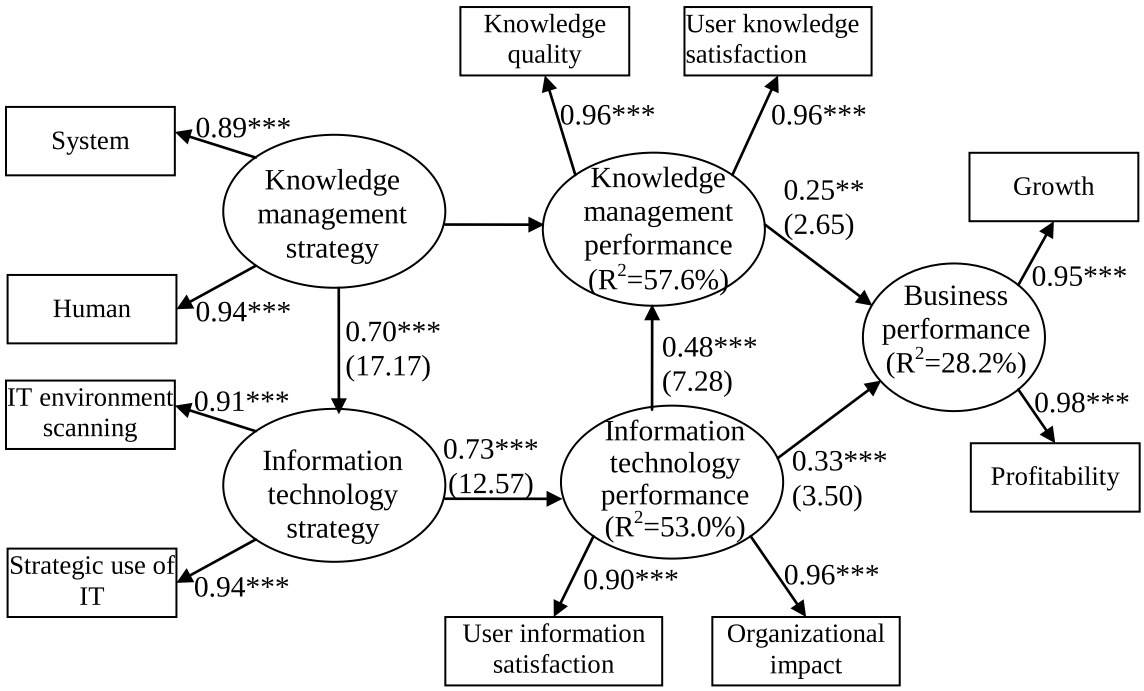
Construct	kss	ksp	iye	iyu	kql	uks	itu	ito	opg	opp
kss	0.88									
ksp	0.68	0.87								
iye	0.54	0.61	0.86							
iyu	0.62	0.61	0.72	0.88						
kql	0.59	0.50	0.58	0.61	0.89					
uks	0.62	0.56	0.58	0.65	0.82	0.89				
itu	0.49	0.56	0.61	0.61	0.57	0.68	0.93			
ito	0.46	0.51	0.60	0.69	0.56	0.67	0.75	0.92		
opg	0.39	0.44	0.33	0.38	0.40	0.49	0.44	0.45	0.96	
opp	0.42	0.44	0.31	0.39	0.40	0.48	0.44	0.47	0.87	0.92

kss: system; ksp: human; iye: IT environment scanning; iyu: strategic use of IT; kql: knowledge quality; uks: user knowledge satisfaction; itu: user information satisfaction; ito: organizational impact; opg: growth; opp: profitability.
Diagonal elements (in bold) represented the square root of Average Variance Extracted (=ΣLi2/(ΣLi2+ΣVar(Ei))), while off-diagonal elements were represented by the correlation coefficient among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.

Table 8. Intercorrelations and AVEs

4.4 Hypothesis Testing

The test results of the structure are summarized in Figure 1. Overall, all of the six paths exhibited significance at the $p < 0.05$ level providing strong support for the proposed model of KM and IT strategy on KM, IT and business performance. The results showed that, consistent with H1 and H2, KM strategy has significant direct effects on IT strategy ($\gamma = 0.70$, $p < 0.001$) and KM performance ($\gamma = 0.38$, $p < 0.001$). Consistent with H4, Figure 2 also showed that IT strategy has a positive direct effect on IT performance ($\beta = 0.73$, $p < 0.001$) with a variance explanation of 53%., and then IT performance has a positive direct effect on KM performance ($\beta = 0.48$, $p < 0.001$). Thus, H4 and H6 are supported. As expected, business performance can be predicted by IT performance and KM performance, explaining 28.2% of the business performance variance. The path from IT performance ($\beta = 0.33$, $p < 0.001$) is stronger than that of KM performance ($\beta = 0.25$, $p < 0.01$). Thus, H3 and H5 are also supported.



Note: Values in the parentheses are T values

Figure 1. Results of structural equation modeling

5 DISCUSSION AND CONCLUSIONS

5.1 Key findings and Discussion

This present research subscribed to the call for the strategic orientation of KM and IT and to test their effects on performance. The results supported the hypotheses, demonstrating that KM strategy and IT strategy have significant positive effects on KM performance and IT performance respectively, and then collectively, have impact on business performance.

5.2 Implications for Researchers

Consistent with the perspectives aforementioned, the emerging body of literature on KM depicts that alignment well among properties of KM, units, relationships, and environment leads to organizational performance as well as KM and IT outcomes (Argote et al. 2003) than that of misalignment, and the relative effectiveness of the types varies with context. Several evidences have been concluded of this conclusion. In this vein, we describe the high-level model briefly below in order to provide a rationale for more detailed discussions about the underlying meanings of KM and IT strategic orientation for performance that follows. Although the contribution of successful KM projects to organization is widely acknowledged, how to attain KM performance or organization performance remains an unsolved question. Fortunately, the abilities of IT to support communications, collaboration, and those searching for knowledge to enable collaborative learning for KM are argued. That is, firms that have excellent IT capabilities allow them to be able to cope with the present competitive and dynamic environment well (Bhatt & Grover 2005). Accordingly, in order to survive in the highly competitive business environment, the content of strategic IT management could be regarded as a complement activity for KM to achieve KM performance, when fitting with certain aspects of KM context is to stimulate researchers' deep though in this topic (Alavi & Leidner 2001).

In short, our research echoed to the point of views for previous studies in terms of the research implications suggested by the strategy of KM in cultivating and developing IT capabilities and strategy to meet performance (Alavi & Leidner 2001; Davenport & Prusak 1998; Wiig 1995). Choosing the right ITs for different KM strategies is critical for organizations (Kim 2001). Improved performance requires appropriate employing KM strategies as well as IT (Mahapatra & Sarkar 2000). By using various IT solutions comply with KM strategy will contribution to the creation of corporate knowledge directories through knowledge mapping or the building of knowledge networks (Wakefield 2005). Therefore, the relationship between KM and IT strategy is highly important (Fehér 2002). Meanwhile, according to the arguments presented by Asoh (2004), as an enabler for KM and IM/IS, IT strategy serves as the delivery-oriented component (Earl 1989) that need to be alignment with KM strategy for improving KM performance and organizational performance. Thus, the following research should integrate both two constructs as the baseline variables to show their essentiality in this field.

5.3 Implications for Practitioners

This research demonstrates that the relationships between KM strategy, IT strategy, and KM/IT performance are conspicuously linked to business performance. The evidences support prior research findings in large firms, and imply that KM-IT relationships affect business performance. The underlying meaning of this study is that using KM strategy will lead to higher performance. Firms also must consider critical complementary resources to synthesize the effects of KM practices. Ideally, selecting and managing IT effectively in KM projects is the way to success.

This study also showed that it is useful to view the relationships between IT and KM as internal consistency or congruence. Firms should aim at integrating IT solutions in KM activities, rather than just focusing on KM strategies. For example, if firms try to develop social networks to promote the sharing of knowledge person-to-person, there must be a reward system encouraging this, and the company must scan the external IT environment and support the latest IT in order to enhance person-to-person communication. Companies that want to develop high-quality and reliable information systems to codify, store, disseminate, and reuse knowledge, must provide extensive training to employees, must have clear, definite job definitions, must tightly link compensation to work performance, and must use IT strategically to connect people with reusable codified knowledge. Only then will higher growth be achieved. All of the above benefits require that CEOs or managers take an active role in seeking IT strategy to support KM strategy.

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