



The Relationship among Knowledge Management, Organizational Learning, and Organizational Performance

Shu-hsien Liao

Graduate School of Management Sciences, Tamkang University

No. 151, Yingjuan Road, Danshuei Jen, Taipei 251, Taiwan, ROC

Tel: 886 - 2- 2621-5656#3396 Fax: 886 - 2- 26223204 E-mail: Michael@mail.tku.edu.tw

Chi-chuan Wu (Corresponding author)

Graduate School of Management Sciences, Tamkang University

No. 151, Yingjuan Road, Danshuei Jen, Taipei 251, Taiwan, ROC

Tel: 886 - 2- 2264-1069 Fax: 886 - 2- 2265-6806 E-mail: ccwu@ttu.edu.tw

Abstract

Knowledge management (KM) and organizational performance are believed to be essential of the success in business. The different results in literatures which declare KM affects organizational performance positively. But there are still some confusing relations between KM and organizational learning (OL). Accordingly, we propose some hypotheses to verify relationships among KM, organizational performance, and organizational learning (OL). Base on a sample of Taiwan knowledge-intensive firms engaged in manufacturing, and financial sectors, data are collected using a mail survey, and hypotheses are tested using structural equation modeling. This paper presents OL as a coordinating mechanism, and the results support it in these samples. Empirical evidence also supports the perspective that KM affects organizational performance through OL. This paper is one of the empirical supports for the role of OL as a mediator between KM and organizational performance. Therefore, the positioning of OL as a mediator is also an important contribution to our thinking on this topic.

Keywords: Knowledge management, Organizational performance, Organizational learning, Structural equation modeling

1. Introduction

According to the resource-based view (RBV), firms gain and sustain competitive advantage by deploying valuable resources (Barney, 1991; Grant, 1996). Undoubtedly, resources accumulation is crucial in influencing business success. However, the straightforward application of the RBV in predicting firm success is too simplistic. In knowledge economy, KM is an important element as well as land, labor, and entrepreneurship. Knowledge management capabilities (i.e., knowledge acquisition, knowledge conversion, and knowledge application) are rooted in the operation of a firm and are derived from configurations of organizational structure and culture (Grant 1996; Moorman 1995).

Knowledge management (KM) and organizational performance are essential of the success in business. The different results in literatures that declare KM affects organizational performance positively. In Darroch (2005) research, the results support some KM process positively affects performance. She claims that knowledge acquisition doesn't positively affect performance directly, and knowledge dissemination doesn't positively affect performance, either. Accordingly, the first objective of this paper is to re-examine the relationship between KM and organizational performance.

Even though recent studies have examined the relationship between KM and organizational performance, this research continues to be hampered by the lack of organizational learning. As Tippins and Ravipreet (2003) mention the relationship between IT competency and firm performance is mediated by organizational learning. Also, KM and OL are two similar concepts, and always confuse by managers. Accordingly, the second objective of this paper is to re-examine the relationship between KM and OL, and propose a mediating conceptualization of OL.

The knowledge-intensive sectors are selected because of having large amount of knowledge input, short product life

cycles, high demand for customized products, and great quantity of production value (Liao et al., 2007). Thus, the results of surveys involving Taiwan knowledge-intensive firms provide a rich data set of information regarding KM behaviors in unstable business environments.

In the sections that follow, we begin with a discussion on the relationship between KM, organizational performance, and OL. Following this, we develop hypotheses representing the relationships between independent variables and dependent ones. We test our hypotheses with the structural equation modeling technique, using data collected from employees in manufacturing and financial firms. Finally, we conclude with a discussion of the results and implications.

2. Literature review and hypotheses

2.1 Knowledge management

Information is becoming ever more important in our economy now, and most business take that knowledge can confer competitive advantage. But most business has been flooded with information, and most of us have more of it than we can handle. Knowledge management (KM) tries to resolve the troublesome paradox for us (Anthes, 1998).

Gold, Malhotra, and Segars (2001) examine that the issue of effective knowledge management from the perspective of organizational capabilities. This perspective suggests that a knowledge infrastructure consisting of technology, structure, and culture along with a knowledge process architecture of acquisition, conversion, application, and protection are essential organizational capabilities or "preconditions" for effective knowledge management. The results provide a basis for understanding the competitive predisposition of a firm as it enters a program of knowledge management.

Researchers have identified many aspects to this knowledge management process: capture, transfer, and use (DeLong, 1997); acquire, collaborate, integrate, experiment (Leonard, 1995); create, transfer, assemble, integrate, and exploit (Teece, 1998); create, transfer use (Skyrme, 1998, Spender, 1996); and create, process (Ivers, 1998). An examination of these various characteristics enables us to group them into four broad dimensions of process capability-Acquisition Process, Conversion Process, Application Processes, and Protection Process (Gold et al., 2001).

Cui et al. (2005) also mention that knowledge management capabilities consist of three interrelated processes: knowledge acquisition, knowledge conversion, and knowledge application (Gold, Malhotra, & Segars, 2001). Knowledge is not only an important resource for a firm, but also it serves as a basic source of competitive advantage (Conner and Prahalad 1996; Gold, Malhotra, and Segars 2001; Grant 1996; Jaworski and Kohli 1993). Therefore, knowledge management capabilities refer to the knowledge management processes in an organization that develop and use knowledge within the firm (Gold, Malhotra, and Segars 2001).

With effective and efficient KM process, most companies claims it will be helpful to organizational performance. Accordingly, KM is taken for granted an important antecedent of organization performance or innovation (Darroch, 2005). But there are still some different results in KM sub-processes, or sub-dimensions, and organizational performance. It needs to verify very carefully.

And, literatures in KM discuss different influence on OL. Some authors find these two focuses are cause and effect simultaneously, and some authors take OL is a cause, KM is an effect; or opposite. In these studies, researchers implicitly assume a perspective of OL \rightarrow KM effect in which the causal direction runs primarily from OL to KM. And a KM \rightarrow OL effect could also account for the associations between KM and OL (Su and Hsieh, 2003, 2004). In this perspective, OL is viewed as a *reaction* to KM rather than an *action* that contributes to KM. So, from the RBV, this study adopt KM \rightarrow OL effect which view OL is a reaction to KM.

2.2 Organizational performance

Performance is a recurrent theme in most branches of management, and it is of interest to both academic scholars and practicing managers. Although the importance of the performance concept (and the broader area, organizational effectiveness) is widely recognized, the treatment of performance in research setting is perhaps one of the thorniest issues confronting the academic researcher today. With the volume of literature on this topic continually increasing, there appears to be little hope of reaching any agreement on basic terminology and definitions. Some have expressed considerable frustration with this concept. Therefore, financial performance, operational performance, and organizational effectiveness should involve in performance (Venkatrman & Ramanujam, 1986).

From a traditional perspective, organizational performance is commonly referred to as financial performance where considerations of budgets, assets, operations, products, services, markets and human resources are crucial in influencing the over-all bottom-line of an organization (Dixon, 1999; Thurbin, 1994; Smith, 1999). As such, the financial benefits of organizational performance are often associated with organizational success (Thurbin, 1994). However, the notion of performance embraces a far wider dimension of interpretations. With the focus on organizational learning, the performance outcomes associated with it need to be more carefully dealt with. The importance of performance measurement system is manifold. Not only does it demonstrate how an organization does, how well it does it and how much progress it makes over time in archiving its goals, most importantly, it helps to manage organizational change

(Yeo, 2003). Hence, qualitative measures are more appropriate in investigating these key objectives that dominate and direct decision-making and action-taking levels (Thurbin, 1994; Herdges, 1998).

In Darroch (2005) research, she uses comparative and internally reflective performance measures, for example "Compared with the industry average, our company is more profitable" and internally reflective performance measures, for example, "We are more profitable than we were five years ago". These performance measures capture both financial measures and non-financial measures (e.g. market share and sale growth.)

However, similar to any organizational resource, effective knowledge management through the development of capabilities should contribute to key aspects of organizational performance (Andrew, 2001). Also, when firms develop greater knowledge management capabilities, they can more effectively develop marketing offerings to meet customer needs (Hunt 2000). With greater knowledge management capabilities, firms can obtain and use knowledge more effectively and efficiently, which results in above-normal performance. Thus, this study propose,

H1: Knowledge management affects organizational performance positively.

2.3 Organizational learning

In this rapid change economics volatility and uncertainty, many organizations are striving to survive and remain competitive. In order to develop and perform, organizational learning (OL) has been regarded as one of the strategic means of archiving long-term organizational success (Senge, 1990; Harung, 1996; Cunningham and Gerrard, 2000). Therefore, the analysis of organizational learning has become an increasingly important area recently. Various works have dealt with the analysis of this construct from differing viewpoints.

Jerez-Gómez et al.(2005) mention that there are many studies that focus on this construct using a psychological approach (Cyert and March, 1963; Daft and Weick, 1984), a sociological approach (Nelson and Winter, 1982; Levitt and March, 1988), or from the point of view of Organizational Theory (Cangelosi and Dill, 1965; Senge, 1990; Huber, 1991). More recently, organizational learning has been considered, from a strategic perspective, as a source of heterogeneity among organizations, as well as a basis for a possible competitive advantage (Grant, 1996; Lei et al., 1996, 1999).

One of the traditional ways to measure learning has been to use so-called "learning curves" (Yelle, 1979; Lieberman, 1987) and "experience curves" (Boston Consulting Group, 1968). However, these curves are "incomplete measuring tools" (Garvin, 1993, p. 89). Organizational learning is a complex multidimensional construct . . . encompassing multiple sub processes" (Slater and Narver, 1994, p. 2). So, Pilar et al. (2005) consider organizational learning to be a latent multidimensional construct including managerial commitment, systems perspective, openness and experimentation, and knowledge transfer and integration.

Facing the current uncertainty environment, business must keep learning to maintain its competitiveness. And, organizational learning will develop well base on well structured knowledge in organizations. In other words, business could have organizational learning capabilities underlying well individual learning (Nonaka and Takeuchi, 1995).

The experimental experience of English enterprises, Garratt (1990) finds that a learning organization is the application of organizational development and learning. In order to satisfy consumers' capricious demands, organization should develop personal or group learning abilities. In order to develop learning abilities, organization should complete well knowledge management process. Without knowledge management, one organization can't develop personal or group learning abilities (Garratt, 1990, Su, Huang, and Hsieh, 2004).

Pilar et al. (2005) also argue that knowledge and, more specifically, its acquisition or creation, along with its dissemination and integration within the organizations; become a key strategic resource to organizational learning. Organizational learning is seen as a dynamic process based on knowledge, which implies moving among the different levels of action, going from the individual to the group level, and then to the organizational level and back again (Huber, 1991; Crossan et al., 1999).

As a viewpoint of system, WeiLing Ke and Kwok Kee Wei (2006) discuss and identified knowledge is the antecedent and the base of organizational learning. Thus, this study propose,

H2: Knowledge management affects organizational learning positively.

Various researches have long acknowledged the importance of organizational learning to overall performance. An organization with a strong organizational learning is not simply a collector or storehouse of knowledge but a processor of it. Feedback from customers, channels, and competitors must be used to develop core competence. The strategic literature suggests that good strategy will allow businesses to earn long-run supernormal profits. Therefore, this study propose,

H3: Organizational learning affects organizational performance positively.

As Tippins and Ravipreet (2003) mention the relationship between IT competency and firm performance is mediated by

organizational learning. From literature review, knowledge management affects organizational learning positively (Garratt, 1990, Su, Huang, and Hsieh, 2004). In Su, Huang, and Hsieh (2004), OL mediates the relationship between KM flow factors and KM flows. Darroch (2005) also finds that knowledge acquisition had more indirect than direct influence on organizational performance. Therefore, this study propose,

H4: Organizational learning will be a mediator between knowledge management and organizational performance.

3. Method

3.1 Sampling and data collection

According to the OECD's definition in 2001, there are two types of knowledge-intensive industries: The first type is high-tech industrial companies in the manufacturing sector, which include the electronic, aerospace, and biotechnology industries. The second type is the knowledge-intensive services, which include education, communications, and information services industries.

The knowledge-intensive sectors are selected because of having large knowledge input, short product life cycles, high demand for customized products, and great quantity of production value (Liao et al., 2006). Thus, the results of surveys involving Taiwan knowledge-intensive firms provide a rich data set of information regarding KM behaviors in unstable business environments. In Taiwan Economic Forum, knowledge-intensive industry to real GDP is 36.7% in 2004. According to Ministry of Economic Affairs reports, the percentage of value-added, this created by Taiwan's domestic knowledge-intensive services to the GDP increase from 37.7 percent in 1991 to 43 percent in 2001. Therefore, Taiwan's domestic industry structure is rapidly shifting towards a more knowledge-intensive approach. The firms selected for empirical study were chosen from the companies listed in Common Wealth Magazine's Top 1000 manufacturers and Top 100 financial firms in 2007.

A total of 600 questionnaires were mailed between Jun. 2007 and Sep. 2007, with 327 valid and complete responses used for subsequent quantitative analysis. Of the 342 in our effective sample, 15 are not avail for analysis. After accounting for respondent refusal and unusable surveys due to substantial missing data, a total of 327 questionnaires responded to our survey. The final response rate, defined as the number of usable responses received from the final sampling frame, is 54.5% (327/600).

Table 1 lists the study's sample distribution according to industry, gender, education, and departments.

3.2 Measures

To adequately build the constructs for testing our hypotheses, we perform a comprehensive review of the literature. From this review, we borrow and adapt valid multiple-scale items. In this study, 5-point Likert scale (1 totally disagree to 5 totally agree) is used. The questionnaire is refined base on a pilot study conducted with managers, and pre-tested conduct with those different from pilot. The format and content of the questionnaire items are initially developed from thorough literature review, and all items are listed in appendix.

We define knowledge management as the process of knowledge acquisition, knowledge conversion, and knowledge application. Knowledge acquisition is defined as the process to seek and acquire new knowledge, or create new knowledge out of existing knowledge through collaboration between individuals and business partners. Knowledge conversion is defined as the ability to make knowledge useful. Knowledge application is defined as the process oriented toward the use of knowledge. We adapted the scale for knowledge management from Gold, Malhotra, and Segars (2001).

Organizational learning is defined as the activities which organizations do in transformation of learning capability including individuals and competitors (Jerez-Gomez et al., 2003). It is considered to be four dimensions: management commitment, system perspective, openness and experimentation, and knowledge transfer and integration. Management commitment is to recognize the relevance of learning, and to develop a culture that promotes the acquisition, creation, and transfer of knowledge as fundamental values. System perspective entails bringing the organization's members together around a common identity. Openness and experimentation is a climate that welcomes the arrival of new ideas and points of view, both internal and external, allowing individual knowledge to be constantly renewed, widened, and improved. Knowledge transfer and integration refers to two closely linked processes, which occur simultaneously rather than successively internal transfer and integration of knowledge.

All the performance dimensions are measured from the perspective of the focal firm. We adapted the scale for organizational performance from Emden, Yaprak, and Cavusgil (2005). Both financial and market performance are measured relative to the focal firm's competitors. Financial performance relates to the success of the business programs in relation to the resources employed in implementing them. We use the specific components which are profitability, ROI, cash-flow, and cost control. Market performance is the success of a business' products and programs in existing businesses and in those related to the future positioning of the firm. The specific components of this measure are market share, market development, and product development. Partnership performance relates to the achievement of

organizational objectives concerning the firm's partners, in terms of the strength, stability, and sustainability of their relationships.

3.3 Analytical approach

This study applies the item-to-total correlation and Cronbach's alpha to establish the adequacy of the measurement model. This study then performs path analysis in LISREL for hypotheses testing (Hair et al., 2006; Nunnally, 1978). The path analysis procedure is common in studies in which a small sample size restricts the use of full structural equation models (Li and Calantone, 1998; Chaudhuri and Holbrook, 2001).

4. Results

The study adopts a multi-step approach for data analysis. The analyses include testing the measurement model by subjecting our measures to a series of confirmatory factor analyses (CFA) by using SPSS12.0 and LISREL 8.51. LISREL's 8.51 maximum likelihood program (Joreskog and Sorbom, 1996) is implemented to test the theoretical model proposed. This method is characterized by its flexible interplay between theory and data, as well as its bridging of theoretical and empirical knowledge for a better understanding of the real world (Fornell, 1981). Such analysis allows for modeling based on both latent variables and manifest variables, which is a property well suited for the hypothesized model, where most of the represented constructs are abstractions of unobservable phenomena.

Table 2 displays the means, standard deviations of variables and their correlations. As can be seen, the following relationships exist between the research variables.

(1) Relationship between knowledge management and organizational performance: Knowledge management is positively related to organizational performance, meaning that business with more knowledge management show higher capability in enhancing organizational performance.

(2) Relationship between knowledge management and organizational learning: Knowledge management is positively related to organizational learning, meaning that business with more knowledge management show higher capability in enhancing organizational learning.

(3) Relationship between organizational learning and organizational performance: organizational learning is positively related to organizational performance, meaning that business with more organizational learning show higher capability in enhancing organizational performance.

Correlations can only reveal the degree of relationship between constructs. To further understand the direct and indirect effects, as well as mediating effects among the constructs, further analysis by structural equation model is required.

4.1 Measure Reliability and Validity

We first use a CFA analysis on our data, using SPSS12.0 and LISREL 8.51, to analyze all measures for validity and reliability, following the guidelines offered by Anderson and Gerbing (1988), and Bollen (1989). The reliabilities of indicators are assessed through their Cronbach's alpha scores (Cronbach, 1951) and composite reliability measures (Fornell and Larcker, 1981). The reliabilities for all the measures are above the recommended limits of .536 and .823. These are displayed in Table 2. And final measurement model shows sufficient fit indices (Table 3) for the interpretation of our findings. Composite reliability is provided as 0.89, 0.884, and 0.838 showing in table 4.

To ensure construct validity, we verify the convergent and discriminate validity of our constructs following the suggestions of Bollen (1989) and Churchill (1979): All of the measurement loadings in the measurement model are significant at the .01 level (convergent validity). Table 3 indicates the fitting index of measurement of each construct. Convergent validity can be judged by considering both the significance of the factor loading and t-values. All the multi-items constructs fit this criterion, and the loading is significantly related to its underlying factor (t-values greater than 1.96) in support of convergent validity (see Table 4).

A series of difference tests on the factor correlations among all the constructs to assess discriminate validity (Anderson and Gerbing, 1988). This is done for one pair of variables at a time by constraining the estimated correlation parameter between them to 1.0 and then performing a difference test on the values obtained for the constrained and unconstrained models (Anderson and Gerbing, 1988). Therefore, we get the results of convergent validity and discriminate validity. Based on Table 4 and Table 5, all t-values show well convergent validity, and the differences of chi-square ($\Delta\chi^2$) are greater than 3.84, where this is a good evidence for the dimensions' discriminate validity.

4.2 Hypothesis testing

To best capture the theoretical interdependencies between KM, organizational performance, and OL, this study analyzes the data using structural equation modeling (LISREL 8.52 statistical package). This procedure allows for a fine analysis of the hypothesized relationships within the context of the entire model. Structural equation modeling is an especially attractive choice when testing mediating variables since all of the relevant paths are directly tested and complications, such as measurement error and feedback, are incorporated directly into the model (Edelman et al., 2005; Venkataraman,

1989). We test the full structural equation model using the maximum likelihood method and raw data as input. The fit indices show an adequate fit. All of the hypothesized paths are found to be significant at the $P < 0.05$ level, except for the path between organizational learning and organizational performance. Consequently, path analysis in LISREL is performed for hypotheses testing.

Table 6 presents the overall model fit and the test of each hypothesis. As shown, the results of path analysis indicate an adequate fit: GFI=0.96, AGFI=0.93, RMSEA=0.059, NFI= 0.97 and CFI=0.99. All four hypotheses are shown in Table 6 for details. The influence of the firm's knowledge management to organizational performance (H1) is significant, as same as we hypothesize in H1 ($\beta=0.34$, $t\text{-value}=2.74$). The positive influence of knowledge management to organizational learning (H2) is also supported by our findings ($\beta=0.78$, $t\text{-value}=11.79$).

While we have expected to find a positive relationship between the firm's organizational learning and its organizational performance (H3), our findings yield a non-significant relationship between these two constructs ($\beta=0.23$, $t\text{-value}=1.88$). In our model, financial performance, marketing performance, and partnership performance are consisted in organizational performance. This study tries to find the reason why H3 is non-significant supported by our data. We test the path between OL and three dimensions of organizational performance each. We get the details from table 7 below. The path between OL and partnership performance is significant positive ($\beta=0.35$, $t\text{-value}=2.66$). But the path between OL and financial performance and marketing performance are non-significant positive ($\beta=0.16$, $t\text{-value}=1.30$; $\beta=0.17$, $t\text{-value}=1.36$). Therefore, the findings partially support the relationship between the firm's OL and its organizational performance (H3).

Under this path analysis, we test the mediation effect of OL. The results of path analysis indicate an adequate fit: GFI=0.98, AGFI=0.96, RMSEA=0.017, NFI=0.98 and CFI=0.99. OL plays a complete mediation role between OL and partnership performance in our model.

5. Discussion

After analysis, we got some results different from the past. Considering that knowledge management between partners with different business backgrounds often involves coordination challenges, exploring the potential role of organizational learning in such business. The underlying motivation of the current research is to discover and explain the significance of knowledge management and organizational learning behavior in these challenges, such as organizational performance.

We hypothesize three capabilities of knowledge management to drive behavioral routines of organizational performance: acquiring, conversion, and application. We use RBV as the foundation for our theoretical reasoning. Barney (1991) referring to Daft says: "...firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc; controlled by a firm that enable the firm to conceive of all implement strategies that improve its efficiency and effectiveness (Daft,1983)." Therefore, KM as a resource is to improve organizational performance which is supported by our H1.

As a perspective of RBV, we contribute that KM is an important elements in business. In this study, OL is viewed as a *reaction* to KM rather than an *action* that contributes to KM. We hypothesize three processes of knowledge management to drive organizational learning. After statistical analysis, KM capabilities are the base to increase OL which is supported by H2. Therefore, this study verifies the KM \rightarrow OL effect which views OL is a reaction to KM. This result is also confirmed by the research of Jerez-Gomez et al. (2005), and Ke and Wei (2006).

In past, the relationship between organizational learning and performance will be positively (Hult et al., 2003; Calantone et al., 2002). But in Emden, Yaprak, Cavusgil (2005), the results say that they are unable to confirm a direct relationship between learning and the firm's financial performance is yet contrary to the findings of Anand and Khanna (2000). In our model, financial performance, market performance, and partnership performance are consisted in organizational performance. This study tries to find the reasons why H3 is non-significant supported by our data. We test the path between OL and three dimensions of organizational performance each. We get the details in table7.

Interestingly, the relationship between the firm's OL and its organizational performance is confirmed by the findings in Emden, Yaprak, Cavusgil (2005). We find the path between OL and partnership performance is significant positive. But the path between OL and financial performance and market performance are non-significant positive. In 2005, Emden, Yaprak, Cavusgil find that there is a path between the firms's marketing performance and its financial performance. Therefore, this relationship may explain why our data fail to show a positive relationship between organizational learning and organizational performance.

Although we are not initially interested in how the three performance measures are interrelated, following the results of the structural equation tests, we test this path respectively (see table 7). We find that OL only has positive influence on partnership performance. Therefore, we can't conclude OL has negative influence on performance. On the contrary, there are some important points to do for researchers and managers. Since OL mediate the relationship between KM and partnership performance, it is more important to take some measures to strengthen OL in organizations.

We hypothesize that OL is a mediator in our research. This study contributes the second finding that we hypothesize that OL mediated the relationship between KM and partnership performance. Therefore, KM will affect partnership performance through OL.

For researchers, we hypothesize that KM is an antecedent affecting OL and organizational performance. This study contributes the finding that KM is an antecedent of OL, and the more KM capability will cause the more OL capability. Accordingly, KM is one of a key fundamental resource of organizations, which is confirmed by RBV.

This study contributes the third finding is knowledge map. Like other maps, it directs this study and provides other research in the future from literature review. We can find the directions precisely and easily from the knowledge map.

For managers, firstly, since KM is an important antecedent, organizations should implement KM thoroughly. In practices, KM implementation almost means the construction KM system. This study suggests that KM implementation is the ability of organization to acquire, converse, and apply their knowledge. After all, system implementation won't equal to the ability to implement. So, managers should consider does one firm set up system only? Or does one firm have the capability to set up and exercise it well?

Secondly, OL mediates the relationship between KM and partnership performance. Managers should take some measures to develop OL in order to link KM and partnership performance, for example: team work, managerial commitment, learning orientation, openness to new ideas...

Thirdly, OL will influence organizational performance under some circumstances. Therefore, managers should not enlarge the perspectives of performance. OL won't influence financial and marketing performance directly. Managers will take other ways to increase them, and this is not the focus of this study.

There are some methodological limitations to this study—notably, single sourcing, and self-reporting. We check this potential problem with the Harman one-factor test (Podsakoff & Organ, 1986). An un-rotated factor analysis of ten focal variables result in a ten-factor solution, as expected, which account for 59.35% of the total variance; and Factor 1 account for 28.75% of the variance. Because a single factor does not emerge and Factor 1 does not explain most of the variance, common method bias is unlikely to be a concern in our data. In addition, the problem of common method bias when dealing with self-report, perceptual data is overstated in the literature and may be fictitious according to several researchers (Spector, 2006).

Utilizing a cross-sectional design with questionnaires is also one of the limitations of this study. A future research strategy that may overcome this limitation is one that involves longitudinal studies in which flow of knowledge and performance can be followed over time. In addition, using objective measures, archival data for some variables, such as organizational performance, may give results that are more objective.

In addition to the nature of data, the generalizability of sampling is another limitation of this study. The study conducts in a specific national context. It is important to note that readers should be cautious when generalizing the results to different cultural contexts. Further, the sample size is relatively small, requiring the increased sample size.

6. Conclusion

This study provides attention to the relationship among KM, organizational performance, and OL. We hope it intrigues researchers to clarify the important relationship among capability behavior patterns, and measures of organizational performance, and leads to more comprehensive investigations.

Acknowledgement

This research was funded by the National Science Council, Taiwan, Republic of China, under contract No. NSC 96-2416-H-032-003-MY2. We are deeply indebted to NSC. Special thanks also go to referee for helpful comments and suggestions.

References

- Akgun, A.E., Keskina, H., Byrne, J.C., Aren, S. (2007). Emotional and Learning Capability and Their Impact on Product Innovativeness and Firm Performance. *Technovation*, Vol. 27, No. 9, pp. 501-513.
- Anand, B.N., Khanna, T. (2000). Do Firms Learn to Create Value? The Case of Alliances. *Strategic Management Journal*, Vol. 21, No. 3, pp. 295-315.
- Anderson, J.C., Gerbing, D.W. (1998). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin*, Vol. 103, No. 3, pp. 411-423.
- Anderson, J.C., Gerbing, D.W. (1998). Some Methods for Re-specifying Measurements Models to Obtain Unidimensional Construct Measurement. *Journal of Marketing Research*, Vol. 19, No 4, pp. 453-460.
- Anthes, G.H. (1998). Learning How to Share. *Computerworld*, Vol. 32, No. 8, pp. 75-77.
- Argyris, C, Schön, D. (1978). *Organizational Learning: A Theory of Action Perspective*, Reading, Mass: Addison

Wesley Publishing.

- Bagozzi, R.P., Yi, Y. (1988). On the Evaluation of Structural Equation Models. *Journal of the Academy of Marketing Science*, Vol. 16, No. 1, pp. 74-94.
- Barney, J.B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, Vol. 17, No. 1, pp. 99-120.
- Bollen, A.K. (1989). *Structural Equations with Latent Variables*. New York: Wiley Publishing.
- Calantone, R.J., Cavusgil, S.T., Zhao, Y. (2002). Learning Orientation, Firm Innovation Capability, and Firm Performance. *Industrial Marketing Management*, Vol. 31, No. 6, pp. 515-524.
- Chaudhuri, Arjun, Holbrook, Morris B. (2001). The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty, *Journal of Marketing*, Vol. 65, No. 2, pp. 81-93.
- Cronbach, L.J. (1951). Coefficient Alpha and the Internal Structure of Tests, *Psychometrika*, Vol. 16, No. 3, pp. 297-334.
- Cui, A.S., Griffith, D.A., Cavusgil, S.T. (2005). The Influence of Competitive Intensity and Market Dynamism on Knowledge Management Capabilities of MNC Subsidiaries. *Journal of International Marketing*, Vol. 13, No. 3, pp. 32-53.
- Darroch, J., MaNaughton, R. (2001). Examining the Link between Knowledge Management Practices and Types of Innovation. *Journal of Intellectual Capital*, Vol. 3, No. 3, pp. 210-222.
- Darroch, J. (2003). Developing a Measure of Knowledge Management Behaviors and Practices. *Journal of Knowledge Management*, Vol. 7, No. 5, pp. 41-54.
- Darroch, J. (2005). Knowledge Management, Innovation, and Firm Performance, *Journal of Knowledge Management*, Vol. 9, No. 3, pp. 101-115.
- Davenport, T.H., Prusak, L. (1998). *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston.
- Dixon, N. M. (1999). *The Organizational Learning Cycle: How We Can Learn Collectively*, 2nd ed., New York: McGraw-Hill, pp. 70-75.
- Drucker, P. (1994). The theory of business. *Harvard Business Review*, September-October, pp. 95-104.
- Emden, Z., Yaprak, A., Cavusgil, S.T. (2005). Learning from Experience in International Alliances: Antecedents and Firm Performance Implications, *Journal of Business Research*, Vol. 58, No. 7, pp. 883-892.
- Fornell, C., Larcker, D.F. (1981). Evaluating Structural Equations Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, Vol. 18, No. 1, pp. 39-50.
- Garratt, B. (1990). *Creating a Learning Organization: A Guide to Leadership, Learning, and Development*. New York: Simon & Schuster.
- Goh, A.S. (2005). Harnessing Knowledge for Innovation: An Integrated Management Framework. *Journal of Knowledge Management*, Vol. 9, No. 4, pp. 6-18.
- Goh, A.S., Richards, G. (1997). Benchmarking the Learning Capability of Organizations. *European Management Journal*, Vol. 15, No. 5, pp. 575-583.
- Gold, A.H., Malhortra, A., Segars, A.H. (2001). Knowledge Management: An Organizational Capabilities Perspective. *Journal of Management Information Systems*, Vol. 18, No. 1, pp. 185-214.
- Grant, R.M. (1996). Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal*, Vol. 17, Winter Special Issue, pp. 109-122.
- Hult, G.T.M., Ferrell, O.C. (1997). Global Organizational Learning Capacity in Purchasing: Construct and Measurement. *Journal of Business Research*, Vol. 40, No. 2, pp. 97-111.
- Jaworski, B.J., Kohli, Ajay K. (1993). Market Orientation: Antecedents and Consequences. *Journal of Marketing*, Vol. 57, No. 3, pp. 53-70.
- Jerez-Gómez, Pilar, Céspedes-Lorente, José, Valle-Cabrera, Ramón. (2005). Organizational Learning Capability: a proposal of measurement. *Journal of Business Research*, Vol. 58, No. 6, pp. 715-725.
- Joreskog, K.G., Sorbom, D. (1993). *LISREL 8 User's Reference Guide*. Chicago: SSI.
- Ke, W.L., Wei, K.K. (2006). Organizational Learning Process: Its Antecedents and Consequences in Enterprise System Implementation. *Journal of Global Information Management*, Vol. 14, No. 1, pp. 1-22.

- Li, T., Calantone, R.J. (1998). The Impact of Market Knowledge Competence on New Product Advantage: Conceptualization and Empirical Examination. *Journal of Marketing*, Vol. 62, No. 4, pp. 13-29.
- Liao, S.H. (2003). Knowledge Management Technologies and Applications—Literature Review from 1995 to 2002. *Expert Systems with Applications*, Vol. 25, No. 2, pp. 155–164.
- Liao, S.H., Fei, W.C., Chen, C.C. (2007). Knowledge Sharing, Absorptive Capacity and Innovation Capability: An Empirical Study on Taiwan's Knowledge Intensive Industries. *Journal of Information Science*, Vol. 33, No. 3, pp. 340–359.
- Liao, S.H., Fei, W.C., Liu, C.T. (2008). Relationship between Knowledge Inertia, Organizational Learning, and Organizational Innovation. *Technovation*, Vol. 28, No. 4, pp. 183-195.
- Lin, H.F., Lee, G.G. (2004). Impact of Organizational Learning and Knowledge Management Factors on E-Business Adoption. *Management Decision*, Vol. 43, No. 2, pp. 171-188.
- Montes, F.J.L., Moreno, A.R., Morales, V.G. (2005). Influence of Support Leadership and Teamwork Cohesion on Organizational Learning, Innovation and Performance: An Empirical Examination. *Technovation*, Vol. 25, No. 10, pp. 1159-1172.
- Nunnally, J. C. (1978). *Psychometric theory*, 2nd ed., New York: McGraw-Hall.
- Oswald, S.L., Mossholder, K.W., Harris, S.G. (1994). Vision Salience and Strategic Involvement: Implications for Psychological Attachment to Organization and Job. *Strategic Management Journal*, Vol. 15, No. 1, pp. 477-89.
- Quinn, J.B., Anderson, P., Finkelstein, S. (1996). Managing Professional Intellect: Making the Most of the Best. *Harvard Business Review*, Vol. 74, No. 2, pp. 71-80.
- Rademakers, M. (2005). Corporate Universities: Driving Force of Knowledge Innovation. *Journal of workplace Learning*, Vol. 17, No. 1, pp. 130-136.
- Senge, P. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. Doubleday, New York.
- Spector, P.E. (2006). Method Variance in Organizational Research: Truth or Urban Legend. *Organizational Research Methods*, Vol. 9, No. 2, pp. 221-232.
- Su, K.J., Hsieh, H.L., Liu, K.A. (2003). Application of the Learning Organization Paradigm in Engineering Education: An Empirical Research of Universities in Taiwan. *World Transactions on Engineering and Technology Education*, Vol. 2, No. 2, pp. 285-290.
- Su, K.J., Huang, L.C., Hsieh, H.L. (2004). The Development of a Knowledge Flow Paradigm in Engineering Education: Empirical Research in Taiwanese Universities. *World Transactions on Engineering and Technology Education*, Vol. 3, No. 1, pp. 125-128.
- Tippins, M.J.S., Ravipreet, S. (2003). IT Competency and Firm Performance: Is Organizational Learning a Missing Link? *Strategic Management Journal*, Vol. 24, No. 8, pp. 745-761.
- Venkatraman, N., Ramanujam, V. (1986). Measurement of Business Performance in Strategy Research: A Comparison of Approaches. *The Academy of Management Review*, Vol. 11, No. 4, pp. 801-814.
- Yeo, R. (2003). Linking Organizational Learning to Organizational Performance and Success: Singapore Case Study. *Leadership & Organization Development Journal*, Vol. 24, No. 1/2, pp. 70-84.

Table 1. Demographic profile of respondents

Demographic variable	Classification	Samples	Percentage
Industry	Manufacturing	164	50.2%
	Financial	163	49.8%
Gender	Male	163	49.8%
	Female	164	50.2%
Education	High School	2	0.6%
	Associate Degree	45	13.8%
	Bachelor Degree	203	62.1%
	Master Degree	77	23.5%
Departments	Manufacturing	9	2.8%
	Management	128	39.1%
	R&D	72	22%
	Others	118	36.1%
Total		327	100%

Table 2. Table of descriptive statistics

Variables	1	2	3	4	5	6	7	8	9	10
KAC	0.761									
KCO	.730(**)	0.700								
KAP	.689(**)	.760(**)	0.807							
MC	.576(**)	.532(**)	.577(**)	0.676						
SP	.553(**)	.507(**)	.575(**)	.675(**)	0.702					
EX	.599(**)	.569(**)	.639(**)	.732(**)	.605(**)	0.656				
TR	.561(**)	.500(**)	.610(**)	.670(**)	.596(**)	.675(**)	0.536			
FP	.374(**)	.353(**)	.368(**)	.323(**)	.404(**)	.324(**)	.288(**)	0.823		
MP	.398(**)	.353(**)	.429(**)	.346(**)	.425(**)	.326(**)	.335(**)	.829(**)	0.797	
PP	.378(**)	.334(**)	.404(**)	.383(**)	.395(**)	.344(**)	.360(**)	.530(**)	.527(**)	0.733
Mean	3.73	3.68	3.78	3.43	3.48	3.56	3.53	3.44	3.44	3.67
SD	.454	.450	.452	.565	.600	.542	.527	.680	.700	.536

Note1: Diagonal number represents reliabilities alpha.

Note 2: **Significant at P<0.01.

Table 3. Fitting Index of Confirmatory Factor Analysis

Index	Knowledge management	Organizational learning	Organizational performance
GFI	0.86	0.92	0.94
SRMR	0.06	0.049	0.044
RMSEA	0.077	0.063	0.081
NNFI	0.94	0.97	0.97
CFI	0.95	0.97	0.98
χ^2	546.3	225.11	100.7
DF	186	98	32
Normed chi-square	2.94	2.3	3.15

Table 4. Reliability and Convergent validity

Variables	Composite Reliability	λ	ε	T-value
Knowledge management	0.890	0.75	0.44	14.69***
		0.73	0.46	14.27***
		0.76	0.42	15.04***
Organizational learning	0.884	0.79	0.38	16.09***
		0.71	0.49	14.06***
		0.73	0.46	14.52***
		0.70	0.51	13.60***
Organizational performance	0.838	0.82	0.33	16.51***
		0.91	0.17	18.98***
		0.52	0.73	9.57***

Note: $|T| \geq 3.29$, at p 0.001 level ***

Table 5. Discriminate validity

Model	χ^2	DF	$\Delta\chi^2$
--	67.82	32	--
Knowledge management-Organizational learning	140.00	33	72.18*
Knowledge management-Organizational performance	306.42	33	238.6*
Organizational learning-Organizational performance	292.88	33	225.06*

Note: * significant $\Delta\chi^2 > 3.84$

Table 6. Testing result

Causal path	Hypothesis	Expected sign	Path coefficient	t-value	Results
Knowledge management-Organizational learning	H1	+	0.34*	2.74	Support
Knowledge management-Organizational performance	H2	+	0.78*	11.79	Support
Organizational learning-Organizational performance	H3	+	0.23	1.88	Partial Support

Table 7. Paths between OL and Organizational performance

Paths	Expected sign	Path coefficient	t-value
Knowledge management-Organizational learning	+	0.16	1.30
Knowledge management-Organizational performance	+	0.17	1.38
Organizational learning-Organizational performance	+	0.35*	2.66

Appendix

Variable	Items
Knowledge acquisition	1 Has processes for acquiring knowledge about our customers.
	2 Has processes for acquiring knowledge about our suppliers.
	3 Use feedback from projects to improve subsequent projects.
	4 Has processes for exchanging knowledge with our business partners.
	5 Has process for acquiring knowledge about new product/services within our industry.
	6 Has process for acquiring knowledge about competitors within our industry
	7 Has process for benchmarking performance.
	8 Has teams devoted to identifying best practice.
Knowledge conversion	1 Has processes for converting knowledge into the design of new product/service.
	2 Has processes for transferring organizational knowledge to individuals.
	3 Has processes for absorbing knowledge form individuals into the organization
	4 Has processes for absorbing knowledge from business partners into the organization.
	5 Has processes for integrating different sources and types of knowledge.
	6 Has processes for replacing outdated knowledge.
Knowledge application	1 Has processes for applying knowledge learned from mistakes or experiences.
	2 Has processes for using knowledge in development of new products/services.
	3 Has processes for using knowledge to solve new problems.
	4 Use knowledge to improve efficiency
	5 Is able to locate and apply knowledge to changing competitive conditions.
	6 Makes knowledge accessible to those who need it.
	7 Quickly links sources of knowledge in solving problems.
Management commitment	1 The managers frequently involve their staff in important decision making processes.
	2 Employee learning is considered more of an expense than an investment.
	3 The firm's management looks favorably on carrying out changes in any area to adapt to and/or keep ahead of new environmental situations.
	4 Employee learning capability is considered a key factor in this firm.
	5 In this firm, innovative ideas that work are rewarded.
System perspective	1 All employees have generalized knowledge regarding this firm's objectives.
	2 All parts that make up this firm (departments, sections, work teams, and individuals) are well aware of how they contribute to achieving the overall objectives.
	3 All parts that make up this firm are interconnected, working together in a coordinated

fashion.

Openness & experimentation	1	This firm promotes experimentation and innovation as a way of improving the work processes.
	2	This firm follows up what other firms in the sector are doing; adopting those practices and techniques it believes to be useful and interesting.
	3	Experiences and ideas provided by external sources (advisors, customers, training firms, etc.) are considered a useful instrument for this firm's learning.
	4	Part of this firm's culture is that employees can express their opinions and make suggestions regarding the procedures and methods in place for carrying out tasks.
Knowledge transfer & integration	1	Errors and failures are always discussed and analyzed in this firm, on all levels.
	2	Employees have the chance to talk among themselves about new ideas, programs, and activities that might be of use to the firm.
	3	In this firm, teamwork is not the usual way to work.
	4	The firm has instruments (manuals, databases, files, organizational routines, etc.) that allow what has been learnt in past situations to remain valid, although the employees are no longer the same.
Financial performance	1	Please rate your organization's performance, relative to your competitors, on each of the following dimensions:
		Profitability
	2	Return on investment
	3	Cash flow from operations
	4	Cost control.
Marketing performance	1	Market development.
	2	Market share.
	3	Sales growth.
Partnership performance	1	Please rate your alliances performance on each of the alliance-related objectives: Strength of your relationship with key alliance partners
	2	Stability of your alliances
	3	Ability to sustain relationships regardless of changes in senior people.