Received 1 May 2008
Revised 23 June 2008
Accepted 11 July 2008

What affects organizational performance?

The linking of learning and knowledge management

Li-An Ho
Department of Educational Technology, Tamkang University, Tamsui, Taiwan

Abstract

Purpose – The purpose of this paper is to propose a conceptual structural equation model to investigate the relationships among self-directed learning (SDL), organizational learning (OL), knowledge management capability (KMC) and organizational performance (OP) and to demonstrate the direct and indirect effect of SDL on OP from the perspectives of KMC and OL.

Design/methodology/approach – An empirical study is conducted in 21 technological companies ($N = 236$) in Taiwan and the collected survey data are used to test the relationships among the four dimensions expressed in the proposed structural equation model.

Findings – The results show that SDL has a direct and significant impact on OL and KMC. SDL influences OP indirectly through OL and KMC. In addition, OL and KMC have direct and significant influences on OP.

Research limitations/implications – The source of data collected is Taiwan, hence, the results may not be easily generalized to other areas or countries. However, the findings are valuable for managers' reference, especially for those whose circumstances are similar to those in Taiwan.

Practical implications – The conceptual structural equation model provides useful information for managers to enhance OP through the adoption of appropriate SDL, OL and KMC strategies.

Originality/value – The study demonstrates how SDL indirectly impacts OP and illustrates the paths of influence through either OL or KMC.

Keywords Self-managed learning, Workplace training, Knowledge management, Organizational performance

Paper type Research paper

1. Introduction

The recent technological advancement opens a new era, in which a global competitive environment has emerged. Traditional organizational management is no longer considered an appropriate strategy in this highly competitive global market. Consequently, businesses must compete for their survival through continuous improvement and innovation to maintain or gain market advantages. In other words, businesses need innovation in order to obtain opportunities for survival. Resistance to innovation is likely to result in crumbled enterprises (Leavy, 1998). Although globalization has opened worldwide trade markets, which brings businesses opportunities that have never been seen before, this phenomenon also opens the door to numerous competitors in various industries. As a result, "employees" are no longer considered as "laborers" who only contribute their manpower. As Drucker (1993) points out, knowledge workers have

Industrial Management & Data Systems
Vol. 108 No. 9, 2008
pp. 1234-1254

0263-5577
DOI 10.1108/02635570810914919

become the most vital asset in the knowledge-based society. Therefore, qualified employees are a critical component of business success, and effective strategies for continuously enhancing employees' competency are in urgent needs.

In Jantunen's (2005) research, he states that knowledge is posited in an organization as a strategic asset which can help the firm maintain its competitive ability in a turbulent environment. In fact, knowledge-based assets and organizational learning (OL) capabilities are critical for a firm's innovation activities (Jantunen, 2005). KM is aimed at getting people to innovate, collaborate, and make correct decisions efficiently; in short, it is aimed at getting people to act by focusing on high-quality knowledge (June, 2005). Knowledge is considered the most important resource in organizations (Choe, 2004), and the characteristics and problems of knowledge do not differ because of different geographic locations (Singh *et al.*, 2008). The success of organizations consequently is built upon organizations' and individuals' speeding learning. Thus, learning in organization is the key for organizations to sustain competitive advantages. As Jude-York (1991) points out, organizations striving in today's fast changing marketplace are facing the need to have employees who know how to learn and who can quickly retool and be ready for new challenges. Self-directed learners seem to be individuals who are most likely to succeed at this and are becoming an increasing valuable resource within the modern organizations (Senge, 1990; Naisbitt and Aburdene, 1985).

A number of existing studies indicate that self-directedness in learning among employees has an important part to play in the competitiveness of enterprises during the 1990s (Edwards, 1995; Calder and McCollumn, 1998; Robinson and Arthy, 1999). Self-directedness among workers is an objective worthy of pursuit by organizations wishing to achieve knowledge and skill development for a competitive edge in a rapidly changing industrial context (Smith *et al.*, 2007). As Smith (2002) points out:

> [...] there is considerable commercial value in encouraging employees to become effective self-directed learners such that they can develop and pursue their learning goals and outcomes that contribute to competitiveness without the need for all learning to occur only when there is direct training by an instructor (p. 100).

However, even current literature is rich in discussion of self-directed learning (SDL), the evidence that the development of SDL is not well supported in the workplace (Smith *et al.*, 2007).

In addition, current studies indicate that a number of organizations have implemented OL strategies (Chan and Ngai, 2008; Lee and Gandolfi, 2007; Chen *et al.*, 2006; Chen and Holton, 2005; Pai, 2006), and have rolled out various professional training programs, SDL and KM programs with the goal of improving organizational performance (OP; Davenport *et al.*, 1998; Gold *et al.*, 2001; Kim and Kil, 2008; Reus and Liu, 2004; Hashim, 2008; Smith *et al.*, 2007; Beitler and Mitlacher, 2007). However, improper strategic planning, insufficient organizational infrastructure and inappropriate diffusion processes may have decreased the value of learning as well as KM, which consequently disappoints employees. Therefore, establishing a systematic organizational structure and fostering an organizational culture which promotes active learning and information sharing are critical issues that should be the focus of all modern organizations (Wickramasinghe, 2007).

This study intends to propose a model to investigate the relationships among SDL, OL, KM capability (KMC) and OP using structural equation modeling. The research participants are from 21 electronic industrial listed and over-the-counter listed

technological companies that are located in the northern, central and southern parts of Taiwan. The study particularly targets at the middle and the top management personnel and explores their complete perception of the actual condition of SDL, OL, KM, and their effect on OP.

2. Theoretical framework

This section reviews the literature to identify the relevant practices comprising SDL, OL, KMC and OP.

2.1 Self-directed learning

Knowles (1975) defines SDL as:

> [...] a process in which learners take the initiative, with or without the help of others, in identifying their learning needs, formulating learning goals, choosing learning resources, employing suitable learning strategies, and assessing learning outcomes (p. 167).

SDL is also regarded as a kind of process that demonstrates individuals' capability, personality, and learning pattern (Teng, 1995). Guglielmino (1977) claims SDL is an ability that represents individuals' voluntary, independent and continuous learning habits. Existing studies show that SDL has many applications in the educational system (Sacchanand and Jaroenpuntaruk, 2006; Garrison, 2008; Weber *et al.*, 2008; Chang, 2007; Terry, 2006), as well as in the corporate setting (Hashim, 2008; Smith *et al.*, 2007; Beitler and Mitlacher, 2007).

There are different instruments to measure SDL. For example, Guglielmino's (1977) SDL aptitude (SDLA), which assesses continuous learning behaviors triggered by active self-learning, including six factors:

(1) effective learning;
(2) fondness for learning;
(3) learning motivation;
(4) active learning;
(5) independent learning; and
(6) creative learning.

Furthermore, SDL readiness (SDLR), which evaluates individuals' continuous learning behaviors on their own initiative, including eight factors:

(1) openness to learning opportunities;
(2) self-concept as an effective learner;
(3) initiative and independence in learning;
(4) informed acceptance of responsibility for one's own learning;
(5) love for learning;
(6) creativity;
(7) positive orientation to the future; and
(8) ability to use basic study skill and problem-solving skills (Guglielmino, 1977; Bonham, 1989).

Furthermore, Oddi (1986) and Livneh (1988) have suggested that self-directed learners are described as individuals who are: committed and open to learning, initiators and persisters, creative and resourceful, can tolerate ambiguity, risk, and complexity, self confident, understand their own learning needs, and take responsibility for their learning. Local studies (Huang, 2004; Chi, 2002) have characterized SDL into four factors, namely self understanding, fondness for learning, active learning and persistent learning. According to the above research, SDL can be classified into four factors: self recognition, fondness for learning, active learning and continuous learning, which are used in our model.

2.2 Organizational learning

According to Holmqvist (2003), OL is concerned with accumulation of experience through various activities or processes in organizations. In other words, OL refers to that the employees precede learning in organizational environments, and apply what they learn in their work (Elkjaer, 2003). Neilson (1997) considers OL as a continuous process of knowledge creation, acquisition and transformation. Bontis *et al.* (2002) propose that OL process consisted of four stages, namely intuiting, interpreting, integrating and institutionalizing, such process has been widely adopted in related OL studies, such as Kang (2006). Similarly, Huber (1991) claims the learning in organizational must go through knowledge acquisition, information distribution, information interpretation, and information memory processes. Like a living system, organizations can learn through knowledge acquisition, information distribution and interpretation as well as organizational memory (Amy, 2005). In conclusion, the process of OL may contain information acquisition, information interpretation and behavioral and cognitive changes (Škerlavaj *et al.*, 2007).

However, OL is difficult to achieve, especially for the sharing of tacit knowledge. In their study, Phusavat and Kess (2008) identify many activities and practices that are useful among knowledge-sharing partners, such as story telling, job rotation across firms, hiring former staffs and shared database. Fairuz *et al.* (2008) suggest the utilization of internet technology to support the processes of personal mastery, shared vision, team learning and systems thinking. In addition, researchers have also proposed distinct measurement dimensions for OL, such as the work of Huber (1991) and Pace *et al.* (1998), based on Levitt and March's (1988) research to develop OL profiles (OLP). The OLP has been applied in many studies as measurement of OL (Subramaniam, 2005). Additionally, Garvin (1993) suggests that a learning organization must be adept at problem solving, experimenting with new approaches, learning from their own experience, following the best practices of others and transferring knowledge quickly and efficiently through the organization. According to the above research, OL can be classified into four factors: information-sharing patterns, inquiry climate, learning practices and achievement mindset, which are used in our model.

2.3 Knowledge management capability

The managerial capability refers to an organization's skills, knowledge, and experiences, which are used to handle difficult and complex tasks in management and production (Choi and Shepherd, 2004). KMC has been recognized as a key factor for gaining and sustaining a competitive advantage (Corsoa *et al.*, 2006). Hsu *et al.* (2007) identify four factors which affect the adoption of KM: information technology, complexity of management and marketing, formal documentation status as well as

knowledge acquisition mechanisms. In addition, existing literature presents various measurements of KMC in organizations. For example, Marquardt (1996) identifies KMC which is consisted of four components: knowledge acquisition, knowledge creation, knowledge storage, as well as knowledge transfer and application. Similarly, Zack (1999) demonstrates four elements of KMC, namely knowledge acquisition, refinement, storage and retrieval, as well as presentation. Gold *et al.* (2001) conclude that organizations' should possess two basic abilities to manage knowledge, namely knowledge infrastructure capability and knowledge process capability. The former is concerned with technology, organizational structure, and corporate culture; the latter is concerned with knowledge acquisition, conversion, and application processes.

Furthermore, Tiwana (2002) proposes that organizational KMCs include finding, creating new, packaging, assembling, reusing and revalidating knowledge. Alavi and Leidner (2001) point out the abilities to create, store, retrieve, transfer and apply knowledge are considered the core of implementing KM in organizations. From a cross-unit perspective, Tanriverdi (2005) proposes a multi-business firm concept, which divides KMC into two categories: KM within and KM across business units. However, every knowledge managing capability must go through a four-step process, including creation of related knowledge, transfer of related knowledge, integration of related knowledge and leverage of related knowledge. Moreover, Gottschalk (2006) identifies five indicators of KMC, including knowledge sharing, knowledge distributing, knowledge creating, knowledge capturing and understanding knowledge. Cepeda and Vera (2007) suggest four categories of KMC, namely knowledge creation, knowledge transfer, knowledge retention, and knowledge utilization. Thus, according to the above research, KMC can be classified into three factors including learning and obtaining, sharing knowledge, and creating and improving knowledge. These three factors are adopted by the present research model.

2.4 Organizational performance

OP is an indicator which measures how well an enterprise achieves their objectives (Venkatraman and Ramanujam, 1986; Hamon, 2003). OP can be assessed by an organization's efficiency and effectiveness of goal achievement (Robbins and Coulter, 2002). Andersen (2006) states that the concept of effectiveness is a ratio, implying that two entities are required when defining and measuring effectiveness (e.g. return on assets). He also argues that when effectiveness is conceptualized as a degree of goal attainment, that is, the achievement of profitability goals. Schermerhorn *et al.* (2002) point out that performance refers to the quality and quantity of individual or group work achievement. Recently, OP, effectiveness and efficiency are synonyms which are interchangeable (Hancott, 2005). Hancott further points out that, a number of indicators have been adopted to measure OP since mid-1900, such as profit growth rate, net or total assets growth rate, return on sales, shareholder return, growth in market share, number of new products, return on net assets, etc. In 1990, return on net assets and return on capital have been applied in performance measurement as well.

A number of studies have applied different ways to measure OP (Schiuma and Lerro, 2008; Garnett *et al.*, 2008; Green and Inman, 2007; Chung and Lo, 2007). In particular, Steer (1975) reviews 17 organizational effectiveness models, integrates these measurements of OP from various studies, and generalizes these measurements into three dimensions: financial performance, business performance and organization effectiveness. In addition, Delaney and Huselid (1996) suggest two ways to assess OP: OP and market performance.

While the former is concerned with product or service quality, product or service innovation, employee attraction, employee retention, customer satisfaction, management/employee relation and employee relation; the latter is concerned with organizational marketing ability, total growth in sale, and total profitability. In addition, Tippins and Sohi (2003) propose OP is measured on four dimensions: relative profitability, return on investment, customer retention, and total sales growth. In the present study, we focus on financial performance and market performance, and adopt these two factors for the OP dimension.

3. Research design

The research model is shown in Figure 1. The relevant hypotheses of the model and questionnaire design are presented below.

3.1 The relationships between self-directed learning and other dimensions

The current and future trends in OL have revealed that SDL is the route preferred by the majority of employees, and that the role of managers in facilitating this is critical to success (*E-learning Age*, 2007). Existing studies have explored the relationship between SDL and OL (Maxwell, 1997; Jude-York, 1991). In particular, Lew (2006) examines the interactive effect of teachers' SDL and the learning practice of a school community on their OL. The results show that the quality and efficiency of professional learning communities lies on the interface between individual learners and social dimensions of the communities. James-Gordon and Bal (2003) suggest adequate learning methods need to be available in order for learning opportunities to exist in organizations. They assert that the effect of SDL is beneficial to OL and the employees' self-development. In accordance with the studies presented above, this study proposes the following hypothesis:

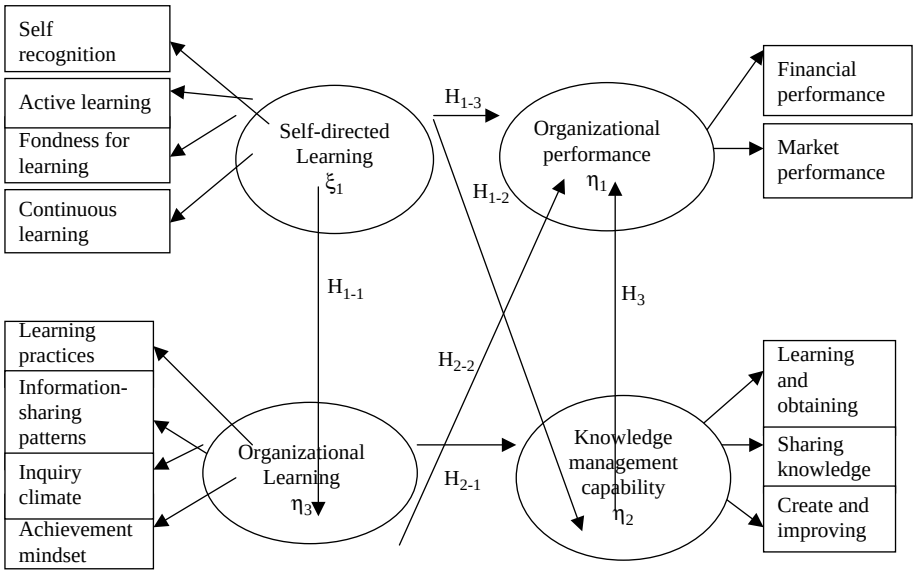

Figure 1.
Research model for structural equation modeling analysis

$H_{1\text{-}1}$. Self-directed learning positively influences organizational learning.

Dolezalek (2004) points out that there is a relationship between KM and SDL. She claims that knowledge bases and online communities are great places for self-directed learners to find the answers they need to do their jobs. Chen (2005) identifies a correlation between SDL readiness and the management competency. Moreover, Åkerlind and Trevitt (1999) discover six ways of understanding SDL: increasing one's knowledge, memorizing and reproducing, applying, understanding, seeing something in a different way, and changing as a person. The first three involve perceive learning as a passive experience, consisting of receiving and absorbing knowledge transmitted by others; the remaining three emphasize the importance of understanding, or gaining meaning from, knowledge (p. 97). Their perspective of SDL is supportive of KM activities, consisting of capturing or creating knowledge, sharing knowledge, measuring the effects and learning and improving (Lim *et al.*, 1999). The second hypothesis, therefore, is defined as follows:

$H_{1\text{-}2}$. Self-directed learning positively influences knowledge management capability.

Kandarian (2004) discovers that SDL is one of the six orientations that are vital for guiding high performing organizations. Janz (1999) demonstrates a self-directed work teams may lead to increased levels of satisfaction, motivation, and performance. The levels of cooperative learning that takes place on the teams may be more important to achieving improved work outcomes. Furthermore, Harvey (1991) reviews management and organizational models and paradigms, and finds that today's businesses need to facilitate greater and broader employee development, in order to be able to address new and increasing demands for OP. In his study, a SDL technology is introduced to organizations in supporting employee generic skills' training, and is found to generate positive results at all levels of the organization. Also, local studies have identified a strong correlation between SDL and work performance (Chen, 2005; Yu, 2002) Thus, we hypothesize that:

$H_{1\text{-}3}$. Self-directed learning positively influences organizational performance.

3.2 The relationships between organizational learning and other dimensions

Harvey *et al.* (2004) propose that one of the key organizational capabilities is to ability to learn to adapt to the fast changing competitive global environment. The goal of learning is enhancing employees' knowledge application ability in this information age. Theriou and Chatzoglou (2008) suggest that KM and OL play their own unique role in creating organizational capabilities, which lead to superior performance. Lee *et al.* (2007) propose that learning capacity and knowledge capability factors are sources of an organization's competitive advantages. Currie and Kerrin (2003) adopt an OL perspective to reflect more critically upon the problems of KM. Existing studies have demonstrated a correlation between OL and KMC, such as Theriou and Chatzoglou (2008), Battor *et al.* (2008), and Sense (2007). Therefore, we construct the fourth hypothesis as follows:

$H_{2\text{-}1}$. Organizational learning positively influences knowledge management capability.

Huber (1998) asserts that OL enhances an organization's ability to innovate, which consequently improves organizational competitiveness and performance. Rhodes *et al.* (2008) discover that OL has the greatest positive relationship with process innovation in knowledge transfer to enhance OP. Theriou and Chatzoglou (2008) propose that that KM and OL play their own unique role in creating organizational capabilities, which lead to superior performance. Yang *et al.* (2007) provide a more thorough assessment of the link between OL and OP. Their findings show that applying OL influences corporate performance. Hanvanich *et al.* (2006) argue how learning orientation and organizational memory are related to important organizational outcomes, not only when firms have different levels of environmental turbulence but also when firms have the same level of environmental turbulence. Ruiz-Mercader *et al.* (2006) contend that individual and OL show significant and positive effects on OP. Thus, we hypothesize that:

$H_{2\text{-}2}$. Organizational learning positively influences organizational performance.

3.3 The relationships between knowledge management capability and other dimensions

Choi *et al.* (2008) analyze KM strategies based on KM source. The result shows that companies could benefit from KM by implementing external- or internal-oriented strategy. That is, combining the tacit-internal-oriented and explicit-external-oriented KM strategies indicates a complementarily relationship, which implies synergistic effects of KM strategies on performance. Afiouni (2007) argues that combining human resource management initiatives with those of KM will help improve OP. Lee and Lee (2007) uncover that there are statistically significant relationships among KMC, processes, and performance. Furthermore, Bogner and Bansal (2007) suggest that there are three components of KM systems that influence firm performance, namely the firm's ability to produce new knowledge, to build on that knowledge, and to effectively capture a high proportion of subsequent spin-offs. Zhang *et al.* (2006) discover that the constructive factors of organizational memory affect OP. In accordance with the studies discussed above, we hypothesize that:

H_3. Knowledge management capacity positively influences organizational performance.

3.4 Questionnaire design

The questionnaire is composed of five parts including: SDL, OL, KMC, OP and personal background. The questions were answered using a five-point Likert scale. Detailed definitions of the dimensions are described in the following sections:

(1) *Self-directed learning*. Based on the literature review (Knowles, 1975; Guglielmino, 1977; Bonham, 1989; Huang, 2004; Chi, 2002), four major constructs were considered, namely self recognition, fondness for learning, active learning and continuous learning.

- *Self-recognition*: refers to the extent to which the individual understands his/her needs for learning.
- *Fondness for learning*: refers to the extent to which the individual is interested and desired in learning.

- *Active learning*: refers to the extent to which the individual is able to be initiative, independent and effective in learning.
- *Continuous learning*: refers to the extent to which the individual is able to continue to learn and take the responsibility in learning.

(2) *Organizational learning*. Based on the literature (Huber, 1991; Pace *et al.*, 1998; Levitt and March, 1988; Subramaniam, 2005; Garvin, 1993), four most frequently used indicators are extracted and considered in this study, namely information-sharing patterns, inquiry climate, learning practices, and achievement mindset.

- *Informational-sharing patterns*: refers to the extent to which information is shared, and how information is shared.
- *Inquiry climate*: refers to the extent to which the individual's attitude towards improving OP by receiving challenges and participating in experiments.
- *Learning practices*: refers to the extent to which the members in the organization actively participate in each learning activity.
- *Achievement mindset*: refers to the extent to which the members in the organization achieve self-realization.

(3) *Knowledge management capability*. According to Lim *et al.* (1999), Gottschalk (2006), and Cepeda and Vera (2007), the measurement of KMC can be conceptualized in three parts, namely, learning and obtaining, sharing knowledge, and creating and improving.

- *Learning and obtaining*: refers to the extent to which the members in the organization are able to understand and acquire knowledge from external sources, structured internal sources as well as unstructured internal sources.
- *Sharing knowledge*: refers to the extent to which the members in the organization use various communication tools (formal and informal) to assist in knowledge sharing.
- *Creating and improving*: refers to the extent to which the members in the organization are able to create new knowledge and enhance work behaviors.

(4) *Organizational performance*. Delaney and Huselid (1996) developed a measurement of marketing performance which includes market share and profit ratio. In addition, Tippins and Sohi (2003) propose OP is measured on four dimensions: relative profitability, return on investment, customer retention, and total sales growth. Based on the literature review, two factors were considered: financial performance and market performance.

- *Financial performance*: refers to the extent to which the organization performs in relative profitability, return on investment, and total sales growth.
- *Market performance*: refers to the extent to which the organization performs in market share, profit ratio, and customer satisfaction.

4. Analysis and result

4.1 Sampling

The data used in this research consists of questionnaire responses from participants in 21 electronic industrial listed and over-the-counter listed technological companies

which located in the northern, central and southern parts of Taiwan. The criteria of company selection are:

- the company must be electronic industrial listed and over-the-counter listed technological company;
- the member of company must exceed 1,000 employees;
- the company must have at least one year experience in implementing knowledge management; and
- the company has strategies that promote learning.

There are 21 technological companies which located at the northern, central and southern parts of Taiwan were qualified and willing to participate in the study. The study particularly targets at the middle and the top management personnel. Each company received 20 questionnaires to answer. A total of 420 survey forms were circulated, of which 245 surveys were returned and 236 were valid for analysis (valid return rate is 59.19 percent). Non-response analysis is conducted to ensure the absence of non-response biases. The results show that there is no difference between respondents and non-respondents. Table I shows the description statistics for dimension.

4.2 Reliability and validity tests

Reliability and validity tests were then conducted for each of the constructs with multivariate measures. Cronbach α reliability estimates were used to measure the internal consistency of these multivariate scales (Nunnally, 1978). In this study, the Cronbach α of each constructs was greater than 0.8, which indicates a strong reliability for our survey instrument (Cuieford, 1965). In addition, measures with item-to-total correlations larger than 0.6 are considered to have high criterion validity (Kerlinger, 1999). Since the item-to-total correlations of each measures was at least 0.61 (Table II), we consider the criterion validity of each scale in this study to be satisfactory. Meanwhile, to ensure that the instrument has reasonable construct validity, both exploratory and confirmatory factor analyses were used. The exploratory factor analysis applied the following rules:

- eigenvalue > 1;
- applying Varimax rotation and extracting factor with loading > 0.6;
- compared factor loading variance > 0.3; and
- item-to-total correlation value > 0.6.

The results of exploratory factor analysis are presented in Table II. The confirmative factor analysis which consists of the convergent and discriminant validity was analyzed following Campbell and Fiske's (1959) criteria. The results show that the

Dimension	Number of items per dimension	Mean	Standard deviation	Order	Cronbach's α
SDL	20	3.5227	0.5042	2	0.9438
OL	15	3.5178	0.3993	4	0.9335
KMC	11	3.5204	0.3662	3	0.9193
OP	9	3.6078	0.3650	1	0.8987

Table I.
Survey structure and description statistics for dimension

Table II.
Factor analysis and internal consistency values for the questionnaire

Dimension	Factor	Percentage of variance	Cumulative percentage	Item-to-total correlations	Cronbach's α
SDL	Self-recognition	48.462		0.6628	0.9135
	Active learning	10.088		0.6482	0.9113
	Fondness for learning	8.773		0.6195	0.9032
	Continuous learning	6.220	73.543	0.7163	0.8946
OL	Learning practices	52.098		0.7296	0.9238
	Information-sharing	8.180		0.7113	0.8845
	Inquiry climate	7.316		0.7120	0.8093
	Achievement mindset	6.750	74.344	0.6641	0.8258
KMC	Learning and obtaining	55.698		0.6647	0.9301
	Sharing knowledge	11.372		0.7010	0.8420
	Creating and improving	9.200	76.270	0.6266	0.8500
OP	Financial performance	55.377		0.5823	0.9004
	Market performance	14.730	70.107	0.5823	0.8609

correlations are all greater than zero and large enough to proceed with discriminant validity. Furthermore, discriminant validity was examined by counting the number of times an item correlates higher with items from other factors than with items from its own factor (Aldawni and Palvai, 2002). Campbell and Fiske suggest that this number should be less than 50 percent. Results also show adequate discriminant validity. Jointly, the constructs in this study exhibit both convergent and discriminant validity.

4.3 Analysis of the structural equation model

The structural equation modeling approach was applied to test the proposed model and hypotheses. The structural equation modeling approach is a multivariate statistical technique for testing structural theory (Tan, 2001). This approach incorporates both observed and latent variables. The analysis for the present study was conducted using LISREL 8.52 and utilizing the maximum likelihood method. In the proposed model (Figure 1), SDL is considered exogenous variables, and OP is considered an endogenous variable. OL and KMC serve as both an endogenous variable (to SDL and to OL) and exogenous variable (to KMC and to OP). The individual questionnaire items were aggregated into specific factor groups. The following four rules were utilized for the hypotheses' structure:

(1) each observed variable has a nonzero loading on the latent factor within the structure, but have a loading of zero towards other latent factors;

(2) no relationship among measurement errors for observed variables;

(3) no relationship among the residuals of latent factors; and

(4) (4) no relationship among residuals and measurement errors.

The reliability results are illustrated in Table III.

Additionally, the analytical results of the LISREL model reveal a satisfactory fit for our sample data. The final result of LISREL analysis is shown in Figure 2.

The final SEM model analysis is shown in Figure 2. The absolute fit measures (GFI = 0.95, AGFI = 0.93, and RMSEA = 0.036) indicates that the structural model either meets or exceeds recommended levels, and thus represents a satisfactory fit for

Dimensions	Factors	Observed indicator reliability (R2)
SDL	Self-recognition	0.55
	Active learning	0.54
	Fondness for learning	0.50
	Continuous learning	0.64
OL	Learning practices	0.63
	Information-sharing	0.60
	Inquiry climate	0.63
	Achievement mindset	0.56
KMC	Learning and obtaining	0.62
	Sharing knowledge	0.68
	Creating and improving	0.50
OP	Financial performance	0.56
	Market performance	0.61

Table III.
Observed indicator reliability of factors

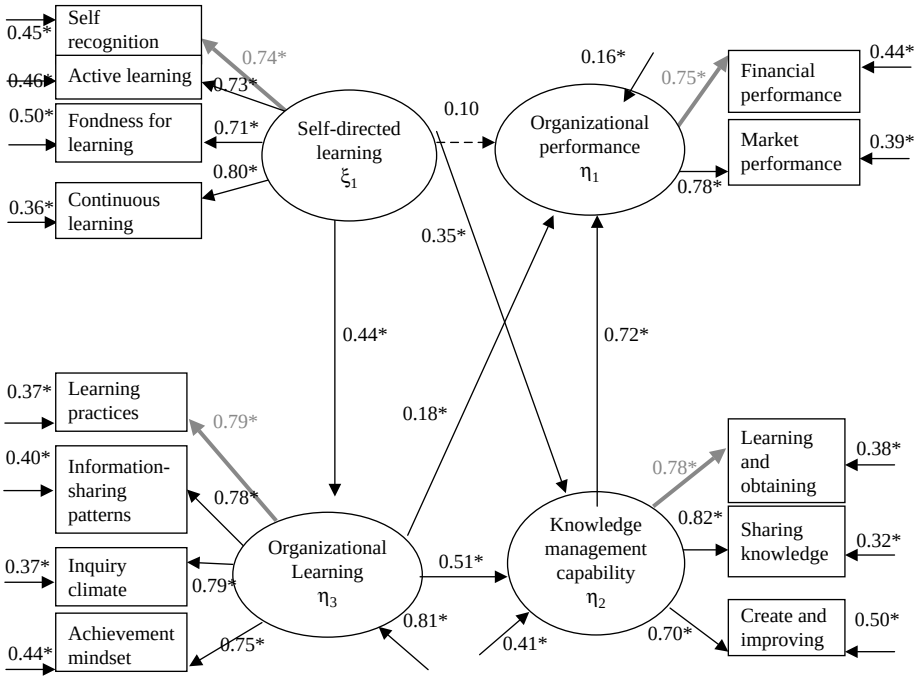

Figure 2.
Results of theoretical model analysis

the sample data collected. The χ^2 statistic divided by the degrees of freedom also indicates a reasonable fit at 1.31. It can be concluded that the proposed model maintains good construct validity (see Table IV for the statistics of the fit test of the model). Based on Figure 2, five of the six hypothesized ($H_{1\text{-}1}$, $H_{1\text{-}2}$, $H_{2\text{-}1}$, $H_{2\text{-}2}$, and H_3) relationships show statistical significance. The results of model analysis are summarized in Table V.

Measures	Indicators
Absolute fit measures	χ^2 with 59 degrees of freedom = 77.16 ($P > .01$); goodness of fit index (GFI) = 0.95; root mean square error of approximation (RMSEA) = 0.036; P-value for test of close fit (RMSEA < 0.05) = 0.85; expected cross-validation index (ECVI) = 0.6 90; percent confidence interval for ECVI = (0.52; 0.71); ECVI for saturated model = 0.77; ECVI for independence model = 14.42; adjusted goodness of fit index (AGFI) = 0.93
Incremental fit measures	Normed fit index (NFI) = 0.98; non-normed fit index (NNFI) = 0.99; comparative fit index (CFI) = 0.99; incremental fit index (IFI) = 0.99; relative fit index (RFI) = 0.97
Parsimonious fit measures	Parsimony normed fit index (PNFI) = 0.74; parsimony goodness of fit index (PGFI) = 0.62; critical N (CN) = 271.34; normed χ^2 77.16/59 = 1.31

Table IV.
Fit test of the model

Hypothesis	Path	Results
$H_{1\text{-}1}$	SDL → OL	Statistically significant
$H_{1\text{-}2}$	SDL → Kmc	Statistically significant
$H_{1\text{-}3}$	SDL → OP	Indirect (through $H_{1\text{-}1}$ or $H_{1\text{-}2}$)
$H_{2\text{-}1}$	OL → KM	Statistically significant
$H_{2\text{-}2}$	OL → OP	Statistically significant
H_3	KM → OP	Statistically significant

Table V.
Summarized observations from model analysis

5. Discussion

The following discussion is based upon the results of the LISREL analysis (Figure 2). It is first noted that SDL has a positive direct influence on OL and KMC ($H_{1\text{-}1}$ and $H_{1\text{-}2}$ are supported) but has no direct influence on OP ($H_{1\text{-}3}$ is not supported). However, SDL has an indirect influence on OP through OL ($H_{1\text{-}1}$ and $H_{2\text{-}2}$ are supported) and through KMC ($H_{1\text{-}2}$ and H_3 are supported).

The results of the current study fail to support the findings of prior studies concerning the influence of SDL on OP (Kandarian, 2004; Janz, 1999; Harvey, 1991; Chen, 2005; Yu, 2002), since we found no direct influence of SDL on OP (i.e. $H_{1\text{-}3}$ is not supported). However, based on the structure of our research model, which includes OL and KMC, the results seem to be reasonable. That is, the model suggests that organizations need to effectively and efficiently manage OL activities and leverage KMC by promoting or implementing an effective SDL system to enhance OP; since SDL can affect OP positively through OL and KMC (i.e. $H_{2\text{-}2}$ and H_3 are supported). Support for $H_{1\text{-}1}$ concludes with the argument that SDL plays a pivotal role in facilitating OL, as proposed by many scholars (Maxwell, 1997; Jude-York, 1991; Lew, 2006; James-Gordon and Bal, 2003). It also shows that SDL positively affects KMC, which is supported by several studies, such as Dolezalek (2004), Chen (2005), Åkerlind and Trevitt (1999) and Lim *et al.* (1999).

From the perspective of OL, the study concludes that it has a positive effect on KMC and OP. Support for this conclusion can be found in many studies, such as Lee *et al.* (2008), Battor *et al.* (2008), Currie and Kerrin (2003), Zellmer-Bruhn and Gibson (2006),

Hanvanich *et al.* (2006), Harvey *et al.* (2004), Sense (2007), Rhodes *et al.* (2008), Ruiz-Mercader *et al.* (2006), Theriou and Chatzoglou (2008), and Yang *et al.* (2007). Lastly, as with previous researches (Afiouni, 2007; Bogner and Bansal, 2007; Choi *et al.*, 2008; Lee and Lee, 2007; Zhang *et al.*, 2006) the results of this study support the finding that KMC has a positive affect on OP.

6. Conclusion

Existing literature has consistently show that SDL among employees is a critical component in sustaining competitiveness of organizations since 1990s (Edwards, 1995; Calder and McCollumn, 1998; Robinson and Arthy, 1999). Smith *et al.* (2007) suggest that self-directedness of employees is worth pursuing by organizations which wish to achieve knowledge and skill development in a competitive fast changing industrial context. The study particularly targets at middle and top management personnel from electronic industrial listed and over-the-counter listed technological companies in Taiwan. The goal was to explore the condition of current SDL, OL, and KMC implementation, and their effect on OP. A theoretical model was proposed and tested using structural equation modeling. Similar models have been largely unexplored by prior researchers.

The findings indicate that SDL can only indirectly impact OP though OL and/or KMC, although SDL still has marginal positive effects on OP. This implies that all SDL policies or activities should be constructed to facilitate the activities of OL and/or KMC; otherwise the positive effects on OP cannot be achieved from the policies or activities of SDL alone. Hence, in order to enhance a firm's OP, the executives should focus on promoting a healthy environment for SDL, as well as formulating effective OL and KMC polices and facilitate their implementation. For example, conditions need to exist in the organization for having the right learning environment, or learning climate as Pedler *et al.* (1997) point out, in which:

- all employees are encouraged to learn and share what they have learned with other employees;
- systems are established in areas of the organization that require learning;
- learning is valued and rewarded in the organization; and
- the organization continuously evolves itself with learning.

In addition, the members of the organization should be given more control and responsibility over their everyday task, self-development and their job-related training to enhance their self-directedness in learning (James-Gordon and Bal, 2003). Therefore, it is imperative that members in the organization (especially middle managers and top managers) engage in OL and KMC activities to enhance OP. A proper culture which nurtures SDL is necessary to trigger the members of the organization to become self-directed learners (Garver, 1996; Jude-York, 1991) who have higher potential to participate in effective OL and KM activities (James-Gordon and Bal, 2003; Dolezalek, 2004), that result in adding value to the firm (Kandarian, 2004).

Several results of this study support the findings of prior research, which proposed a positive relationship between SDL and OL, SDL and KMC, OL and KMC, and a positive influence of KMC and OL on OP. For example, the OL perspective is a critical issue in KM (Currie and Kerrin, 2003) and the interaction effects of action learning and

grounded theory, two widely accepted research methods, can be used to discover and articulate new organizational knowledge (Pauleen *et al.*, 2007). In addition, OL and KMC are direct sources for better strategic planning and OP (El-Korany, 2007; Zellmer-Bruhn and Gibson, 2006; Hanvanich *et al.*, 2006; Ruiz-Mercader *et al.*, 2006; Bogner and Bansal, 2007; Lee and Lee, 2007). This implies that the establishment of KMC and facilitation of OL by promoting a SDL system (or culture) should be a critical success factor for organizations. It is necessary to strengthen the members of the organization SDL capability or practice in order to facilitate the diffusion and implementation of OL and KMC which ultimately enhances OP.

Even though the empirical results of this study largely support the current model, at least two limitations should be carefully considered. First, since individual informants provide the empirical data, possible biases or preferences (e.g. learning styles, communication methods, social preferences, etc.) may exist due to different personal experiences, family or educational backgrounds. Secondly, the data were collected in Taiwan; the characteristics of these firms surveyed may be quite different from those in other areas or countries. Hence, the present results should not be assumed to represent the general case. However, it may provide a fundamental reference for the firms located in other areas or countries whose environments are similar to those in Taiwan.

References

Afiouni, F. (2007), "Human resource management and knowledge management: a road map toward improving organizational performance", *Journal of American Academy of Business, Cambridge*, Vol. 11 No. 2, pp. 124-30.

Åkerlind, G.S. and Trevitt, A.C. (1999), "Enhancing self-directed learning through educational technology: when students resist the change", *Innovations in Education and Teaching International*, Vol. 36 No. 2, pp. 96-105.

Alavi, M. and Leidner, D. (2001), "Review: knowledge management and knowledge management systems: conceptual foundations and research issues", *MIS Quarterly*, Vol. 25 No. 1, pp. 107-36.

Aldawni, A.M. and Palvai, P.C. (2002), "Developing and validating an instrument for measuring user-perceived web quality", *Information & Management*, Vol. 39 No. 6, pp. 467-76.

Amy, A.H. (2005), "Leaders as facilitators of organizational learning", unpublished doctoral dissertation, Regent University, Virginia Beach, VA.

Andersen, J.A. (2006), "Leadership, personality and effectiveness", *Journal of Socio-Economics*, Vol. 35 No. 6, pp. 1078-91.

Battor, M., Zairi, M. and Francis, A. (2008), "Knowledge-based capabilities and their impact on performance: a best practice management evaluation", *Business Strategy Series*, Vol. 9 No. 2, pp. 47-56.

Beitler, M.A. and Mitlacher, L.W. (2007), "Information sharing, self-directed learning and its implications for workplace learning: a comparison of business student attitudes in Germany and the USA", *Journal of Workplace Learning*, Vol. 19 No. 8, pp. 526-36.

Bogner, W.C. and Bansal, P. (2007), "Knowledge management as the basis of sustained high performance", *Journal of Management Studies*, Vol. 44 No. 1, pp. 165-88.

Bonham, L.A. (1989), "Self-directed learning: emerging theory & practice", in Long, H. (Ed.), *Self-directed Orientation toward Learning: A Learning Style*, Oklahoma Research Center for Continuing Professional and Higher Education, University of Oklahoma, Norman, OK, pp. 55-68.

Bontis, N., Crossan, M.M. and Hulland, J. (2002), "Managing on organizational learning system by aligning stocks and flows", *Journal of Management Studies*, Vol. 39 No. 4, pp. 437-69.

Calder, J. and McCollumn, A. (1998), *Open and Flexible Learning in Vocational Education & Training*, Kogan Page, London.

Campbell, D.T. and Fiske, D.W. (1959), "Convergent and discriminant validation by the multitrait-multimethod matrix", *Psychology Bulletin*, Vol. 53, pp. 81-105.

Cepeda, G. and Vera, D. (2007), "Dynamic capabilities and operational capabilities: a knowledge management perspective", *Journal of Business Research*, Vol. 60 No. 5, pp. 426-37.

Chan, S.C.H. and Ngai, E.W.T. (2008), "Electronic learning systems: an analysis of the characteristics of adopters and non-adopters", *International Journal of Innovation and Learning*, Vol. 5 No. 6, pp. 664-82.

Chang, C-C. (2007), "Evaluating the effects of competency-based web learning on self-directed learning aptitudes", *The Journal of Computers in Mathematics and Science Teaching*, Vol. 26 No. 3, pp. 197-216.

Chen, H-Y. (2005), "The study on the relationship of the self-directed learning readiness and management competency and job performance – perceived organization supporting as moderator", unpublished Master's thesis, National Sun Yat-Sen University, Kaohsiung.

Chen, H-C. and Holton, E.F. III and Bates, R. (2005), "Development and validation of the learning transfer system inventory in Taiwan", *Human Resource Development Quarterly*, Vol. 16 No. 1, pp. 55-84.

Chen, S-H., Yang, C-C. and Shiau, J-Y. (2006), "The application of balanced scorecard in the performance evaluation of higher education", *The TQM Magazine*, Vol. 15 No. 2, pp. 190-256.

Chi, S-Y. (2002), "The relation between self-directed learning readiness and knowledge sharing willingness for business employees", unpublished Masters thesis, National Chi-Nan University, Taiwan.

Choe, J. (2004), "The consideration of cultural differences in the design of information systems", *Information and Management*, Vol. 41 No. 5, pp. 669-88.

Choi, B., Poon, S.K. and Davis, J.G. (2008), "Effects of knowledge management strategy on organizational performance: a complementarily theory-based approach", *Omega*, Vol. 36 No. 2, pp. 235-51.

Choi, Y.R. and Shepherd, D.A. (2004), "Entrepreneurs' decisions to exploit opportunities", *Journal of Management*, Vol. 30 No. 3, pp. 377-95.

Chung, R-G. and Lo, C-L. (2007), "The relationship between leadership behavior and organizational performance in non-profit organizations, using social welfare charity foundations as an example", *Journal of American Academy of Business, Cambridge*, Vol. 12 No. 1, pp. 83-7.

Corsoa, M., Martinib, A., Pellegrinib, L., Massac, S. and Testac, S. (2006), "Managing dispersed workers: the new challenge in knowledge management", *Technovation*, Vol. 26 Nos 5/6, pp. 583-94.

Cuieford, J.P. (1965), *Fundamental Statistics in Psychology and Education*, 4th ed., McGraw-Hill, New York, NY.

Currie, G. and Kerrin, M. (2003), "Human resource management and knowledge management: enhancing knowledge sharing in a pharmaceutical company", *International Journal of Human Resource Management*, Vol. 14 No. 6, pp. 1027-45.

Davenport, T.H., De Long, D.W. and Beers, M.C. (1998), "Successful knowledge management projects", *Sloan Management Review*, Vol. 39 No. 2, pp. 43-57.

Delaney, J.T and Huselid, M.A (1996), "The impact of human resource management practices on perceptions of performance in for-profit and nonprofit organizations", *Academy of Management Journal*, Vol. 39, pp. 949-69.

Dolezalek, H. (2004), "Building better learners", *Training*, Vol. 41 No. 1, pp. 30-4.

Drucker, B. (1993), *Post Capitalist Society*, Harper Business, New York, NY.

E-learning Age (2007), "Employees want self-directed learning", *E-learning Age*, Vol. 3, available at: http://proquest.umi.com/pqdweb?index = 0&did = 1266652591&SrchMode = 2&sid = 2&Fmt = 3&VInst = PROD&VType = PQD&RQT = 309&VName = PQD&TS = 1214671393&clientId = 17631 (accessed June 28, 2008).

Edwards, R. (1995), "Different discourse, discourses of difference: globalisation, distance education and open learning", *Distance Education*, Vol. 16, pp. 241-55.

El-Korany, A. (2007), "A knowledge management application in enterprises", *International Journal of Management and Enterprise Development*, Vol. 4 No. 6, pp. 693-702.

Elkjaer, B. (2003), "Organizational learning with a pragmatic slant", *International Journal of Lifelong Education*, Vol. 22 No. 5, pp. 481-94.

Fairuz, A.R.M., Chong, S.C. and Chew, K-W. (2008), "Learning organisation disciplines and internet usage: an empirical study from Malaysia", *International Journal of Management and Enterprise Development*, Vol. 5 No. 4, pp. 462-83.

Garnett, J.L., Marlowe, J. and Pandey, S.K. (2008), "Penetrating the performance predicament: communication as a mediator or moderator of organizational culture's impact on public organizational performance", *Public Administration Review*, Vol. 68 No. 2, pp. 266-81.

Garrison, W.H. (2008), "Democracy and education: empowering students to make sense of their world", *Phi Delta Kappan*, Vol. 89 No. 5, pp. 347-8.

Garver, C.R. (1996), "Organizational learning climate, self-directed learner characteristics, and job performance among police officers", unpublished EdD dissertation, The Pennsylvania State University, Philadelphia, PA.

Garvin, D.A. (1993), "Building a learning organization", *Harvard Business Review*, Vol. 71 No. 4, pp. 78-91.

Gold, A.H., Malhotra, A. and Segars, A.H. (2001), "Knowledge management: an organizational capabilities perspective", *Journal of Management Information Systems*, Vol. 18 No. 1, pp. 185-214.

Gottschalk, P. (2006), "Stages of knowledge management systems in police investigations", *Knowledge-Based Systems*, Vol. 19 No. 6, pp. 381-7.

Green, K.W. and Inman, R.A. (2007), "The impact of JIT-II-selling on organizational performance", *Industrial Management & Data Systems*, Vol. 107 No. 7, pp. 1018-35.

Guglielmino, L. (1977), "Development of self-directed learning readiness scale", *Doctoral Dissertation Abstracts International*, Vol. 38, p. 6467A.

Hamon, T.T. (2003), "Organizational effectiveness as explained by social structure in a faith-based business network organization", unpublished doctoral dissertation, Regent University, Virginia Beach, VA.

Hancott, D.E. (2005), "The relationship between transformational leadership and organizational performance in the largest public companies in Canada", unpublished doctoral dissertation, Capella University, Minneapolis, MN.

Hanvanich, S., Sivakumar, K., Tomas, G. and Hult, M. (2006), "The relationship of learning and memory with organizational performance: the moderating role of turbulence", *Journal of the Academy of Marketing Science*, Vol. 34 No. 4, pp. 600-12.

Harvey, J.H. (1991), "Educational change in the management of organizational development", unpublished doctoral dissertation, The Union Institute, Cincinnati, OH.

Harvey, M., Novicevic, M.M. and Garrison, G. (2004), "Challenges to staffing global virtual teams", *Human Resource Management Review*, Vol. 14, pp. 275-94.

Hashim, J. (2008), "Competencies acquisition through self-directed learning among Malaysian managers", *Journal of Workplace Learning*, Vol. 20 No. 4, pp. 259-71.

Holmqvist, M. (2003), "A dynamic model of intra- and inter-organization learning", *Organization Studies*, Vol. 24 No. 1, pp. 95-123.

Hsu, R-C., Lawson, D. and Lang, T-P. (2007), "Factors affecting knowledge management adoption of Taiwan small and medium-sized enterprises", *International Journal of Management and Enterprise Development*, Vol. 4 No. 1, pp. 30-51.

Huang, M-Y. (2004), "Research of relationship among self-directed learning readiness, classroom climate and learning satisfaction of adult learners", unpublished doctoral dissertation, National Kaohsiung Normal University, Taiwan.

Huber, G.P. (1991), "Organizational learning: the contributing processes and the literatures", *Organization Science*, Vol. 2 No. 1, pp. 88-115.

Huber, G.P. (1998), "Synergies between organizational learning and creativity and innovation", *Creativity and Innovation Management*, Vol. 7 No. 1, pp. 3-8.

James-Gordon, Y. and Bal, J. (2003), "The emerging self-directed learning methods for design engineers", *The Learning Organization*, Vol. 10 No. 1, pp. 63-9.

Jantunen, A. (2005), "Knowledge-processing capabilities and innovative performance: an empirical study", *European Journal of Innovation Management*, Vol. 8 No. 3, pp. 336-49.

Janz, B.D. (1999), "Self-directed teams in IS: correlates for improved systems development work outcomes", *Information & Management*, Vol. 35 No. 3, pp. 171-92.

Jude-York, D.A. (1991), "Organizational learning climate, self-directed learners, and performance at work", unpublished doctoral dissertation, The Fielding Institute, Santa Barbara, CA.

June (2005), "Drivers of knowledge management in the corporate environment", *International Journal of Information Management*, Vol. 25 No. 3, pp. 193-202.

Kandarian, F. (2004), "Executive learning related to high performance in two companies", unpublished EdD dissertation, Columbia University Teachers College, New York, NY.

Kang, D. (2006), "The workflow application as an unintended medium for organizational learning: a longitudinal field study", *Information and Organization*, Vol. 16 No. 2, pp. 169-90.

Kerlinger, F.N. (1999), *Foundations of Behavior Research*, 4th ed., Harcourt College Publishing, Fort Worth, TX.

Kim, G-M. and Kil, E-S. (2008), "Architectural features of knowledge management success organizations", *International Journal of Innovation and Learning*, Vol. 5 No. 6, pp. 617-32.

Knowles, M. (1975), *Self-directed Learning as a Guide for Learners and Teachers*, Adult Education Company, Cambridge, MA.

Leavy, B. (1998), "The concept of learning in the strategy field: review and outlook", *Management Learning*, Vol. 29 No. 4, pp. 447-66.

Lee, C-P., Lee, G-G. and Lin, H-F. (2007), "The role of organizational capabilities in successful e-business implementation", *Business Process Management Journal*, Vol. 13 No. 5, pp. 677-93.

Lee, C-K., Tan, B. and Chiu, J-Z. (2008), "The impact of organisational culture and learning on innovation performance", *International Journal of Innovation and Learning*, Vol. 5 No. 4, pp. 413-28.

Lee, L.T-S. and Gandolfi, F. (2007), "A tertiary school organisation on the road to become a learning organization", *International Journal of Innovation and Learning*, Vol. 4 No. 3, pp. 290-307.

Lee, Y.C. and Lee, S.K. (2007), "Capability, processes, and performance of knowledge management: a structural approach", *Human Factors and Ergonomics in Manufacturing*, Vol. 17 No. 1, pp. 21-41.

Levitt, B. and March, J. (1988), "Organizational learning", *Annual Review of Sociology*, Vol. 14, pp. 319-40.

Lew, C. (2006), "The professional learning community: the self-directed learning of teachers and the practices of professional community", unpublished doctoral dissertation, Texas State University-San Marcos, San Marcos, TX.

Lim, K.K., Ahmed, P.K. and Zairi, M. (1999), "Managing for quality through knowledge management", *Total Quality Management*, Vol. 10 Nos 4/5, pp. 615-21.

Livneh, C. (1988), "Characteristics of lifelong learners in the human services professions", *Adult Education Quarterly*, Vol. 38, pp. 149-59.

Marquardt, M.J. (1996), *Building the Learning Organization*, McGraw-Hill, New York, NY.

Maxwell, R.C. (1997), "Problem-based learning in organizations: a study of self-directed learning instructional technology, and teamwork", unpublished doctoral dissertation, Georgia State University, Milledgeville, GA.

Naisbitt, J. and Aburdene, P. (1985), *Re-inventing the Corporation*, Warner Books, New York, NY.

Neilson, R. (1997), *Collaborative Technologies & Organizational Learning*, Idea Group Publishing, Hersey, PA.

Nunnally, J.C. (1978), *Psychometric Theory*, 2nd ed., McGraw-Hill, New York, NY.

Oddi, L.F (1986), "Development and validation of an instrument to identify self-directed continuing learners", *Adult Education Quarterly*, Vol. 36, pp. 97-107.

Pace, R.W., Regan, L., Miller, P. and Dunn, L. (1998), "Natural growth goals and short-term training: a boomerang effect", *International Journal of Training and Development*, Vol. 2 No. 2, pp. 128-40.

Pai, J-C. (2006), "An empirical study of the relationship between knowledge sharing and IS/IT strategic planning (ISSP)", *Management Decision*, Vol. 44 No. 1, pp. 105-23.

Pauleen, D.J., Corbitt, B. and Yoong, P. (2007), "Discovering and articulating what is not yet known: using action learning and grounded theory as a knowledge management strategy", *The Learning Organization*, Vol. 14 No. 3, pp. 222-40.

Pedler, M., Burgoyne, J. and Boydell, T. (1997), *The Learning Company*, McGraw-Hill Publishing Company, London.

Phusavat, K. and Kess, P. (2008), "Roadmap for knowledge sharing and transfer: sustaining outsourcing relationships", *International Journal of Innovation and Learning*, Vol. 5 No. 5, pp. 496-511.

Reus, T.H. and Liu, Y. (2004), "Rhyme and reason: emotional capability and the performance of knowledge-intensive work groups", *Human Performance*, Vol. 17 No. 2, pp. 245-66.

Rhodes, J., Lok, P., Hung, R.Y-Y. and Fang, S-C. (2008), "An integrative model of organizational learning and social capital on effective knowledge transfer and perceived organizational performance", *Journal of Workplace Learning*, Vol. 20 No. 4, pp. 245-58.

Robinson, C. and Arthy, K. (Eds) (1999), *Lifelong Learning: Developing a Training Culture*, National Centre for Vocational Education Research, Adelaide.

Robbins, P.S. and Coulter, M. (2002), *Management*, Prentice-Hall, Upper Saddle River, NJ.

Ruiz-Mercader, J., Meroño-Cerdan, A.L. and Sabater-Sánchez, R. (2006), "Information technology and learning: their relationship and impact on organizational performance in small business", *International Journal of Information Management*, Vol. 26 No. 1, pp. 16-29.

Sacchanand, C. and Jaroenpuntaruk, V. (2006), "Development of a web-based self-training package for information retrieval using the distance education approach", *The Electronic Library*, Vol. 24 No. 4, pp. 501-16.

Schermerhorn, J.R. Jr, Hunt, J.M. and Osborn, R.N. (2002), *Organizational Behavior*, 7th ed., Wiley, New York, NY.

Schiuma, G. and Lerro, A. (2008), "Intellectual capital and company's performance improvement", *Measuring Business Excellence*, Vol. 12 No. 2, pp. 3-9.

Senge, P.M. (1990), *The Fifth Discipline: The Art and Practice of the Learning Organization*, Doubleday Currency, New York, NY.

Sense, A.J. (2007), "Stimulating situated learning within projects: personalizing the flow of knowledge", *Knowledge Management Research & Practice*, Vol. 5 No. 1, pp. 13-21.

Singh, M.D., Kant, R. and Narain, R. (2008), "Knowledge management practices: a sectorial analysis", *International Journal of Innovation and Learning*, Vol. 5 No. 6, pp. 683-710.

Škerlavaj, M., Štemberger, M., Škrinjar, R. and Dimovski, V. (2007), "Organizational learning culture: the missing link between business process change and organizational performance", *International Journal of Production Economics*, Vol. 106 No. 2, pp. 346-67.

Smith, P.J. (2002), "Modern learning methods: rhetoric and reality – further to Sadler-Smith *et al.*", *Personnel Review*, Vol. 31 No. 1, pp. 103-13.

Smith, P.J., Sadler-Smith, E., Robertson, I. and Wakefield, L. (2007), "Leadership and learning: facilitating self-directed learning in enterprises", *Journal of European Industrial Training*, Vol. 31 No. 5, pp. 324-35.

Steer, R.M. (1975), "Problems in the measurement of organizational effectiveness", *Administrative Science Quarterly*, Vol. 20 No. 4, pp. 546-58.

Subramaniam, R. (2005), "A multivariate study of the relationship between organizational learning, organizational innovation and organizational climate in the Australian hotel industry", unpublished doctoral dissertation, Swinburne University of Technology, Melbourne.

Tan, K.C. (2001), "A structure equation model of new product design and development", *Decision Science*, Vol. 32 No. 2, pp. 195-226.

Tanriverdi, H. (2005), "Information technology relatedness, knowledge management capability, and performance of multibusiness firms", *MIS Quarterly*, Vol. 29 No. 2, pp. 311-34.

Teng, Y. (1995), *Adult Instruction and Self-directed Learning*, Wu-Nan Publication, Taipei.

Terry, M. (2006), "Self-directed learning by undereducated adults", *Educational Research Quarterly*, Vol. 29 No. 4, pp. 28-38.

Theriou, G.N. and Chatzoglou, P.D. (2008), "Enhancing performance through best HRM practices, organizational learning and knowledge management: a conceptual framework", *European Business Review*, Vol. 20 No. 3, pp. 185-207.

Tippins, M.J. and Sohi, R.S. (2003), "It competency and firm performance: is organizational learning a missing link", *Strategic Management Journal*, Vol. 24, pp. 745-61.

Tiwana, A. (2002), *The Knowledge Management Toolkit: Practical Techniques for Building a Knowledge Management*, Prentice-Hall, Upper Saddle River, NJ.

Venkatraman, N. and Ramanujam, V. (1986), "Measurement of business economic performance: an examination of method convergence", *Journal of Management Development*, Vol. 13 No. 1, pp. 109-22.

Weber, C.L., Boswell, C. and Smith, D. (2008), "Different paths to accountability: defining rigorous outcomes for gifted learners", *Gifted Child Today*, Vol. 31 No. 1, pp. 54-65.

Wickramasinghe, N. (2007), "Fostering knowledge assets in healthcare with the KMI model", *International Journal of Management and Enterprise Development*, Vol. 4 No. 1, pp. 52-65.

Yang, C., Wang, Y-D. and Niu, H-J. (2007), "Does industry matter in attributing organizational learning to its performance? Evidence from the Taiwanese economy", *Asia Pacific Business Review*, Vol. 13 No. 4, pp. 547-63.

Yu, Y-P. (2002), "A Study on the Relationships among employee personality, self-directed learning, and work performance", unpublished Master's thesis, National Sun Yat-Sen University, Kaohsiung.

Zack, M.H. (1999), "Managing codified knowledge", *Sloan Management Review*, Vol. 40 No. 4, pp. 45-58.

Zellmer-Bruhn, M. and Gibson, C. (2006), "Multinational organization context: implications for team learning and performance", *Academy of Management Journal*, Vol. 49 No. 3, pp. 501-18.

Zhang, L., Tian, Y. and Qi, Z. (2006), "Impact of organizational memory on organizational performance: an empirical study", *The Business Review, Cambridge*, Vol. 5 No. 1, pp. 227-32.

Further reading

Argyris, C. and Schon, D. (1978), *Organizational Learning: A Theory of Action Perspective*, Addison-Wesley, Boston, MA.

Delery, J.E. and Doty, D.H. (1996), "Modes of theorizing in strategic human resource management: tests of universalistic, contingency, and configurationally performance predictions", *Academy of Management Journal*, Vol. 39 No. 4, pp. 802-35.

Huselid, M.A., Jackson, S.E. and Schuler, R.S. (1997), "Technical and strategic human resource management effectiveness as determinants of firm performance", *Academy of Management Journal*, Vol. 40 No. 1, pp. 171-88.

Corresponding author

Li-An Ho can be contacted at: lianho@mail.tku.edu.tw