



Assessing Perceived Knowledge Creation: The Role of Organizational Knowledge and Market Environment

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The purpose of this research is to investigate the impact of organizational knowledge factors and market knowledge factors on knowledge creation among Thai innovative companies. 464 questionnaires were distributed to Thai innovative companies registered under the National Innovation Agency (NIA) and 217 were returned. Structural Equation Modelling (SEM) is used to determine the effect of two sets of knowledge creation sources: organizational knowledge (social interaction, organizational routines and information system) and market knowledge (customer orientation, competitor orientation and supplier orientation) on knowledge creation (product and service outcome, process outcome and market outcome). The results indicated that the integration of organizational knowledge and market knowledge is the main driver of knowledge creation. Furthermore, the findings suggest that social interaction and customer orientation are the most significant predictors of knowledge creation. This study provides an empirical analysis on the importance of different sources of knowledge in the knowledge creation process in SMEs and its impact on companies' innovative knowledge outcomes.

Keywords: organizational knowledge, market knowledge, knowledge creation, National Innovation Agency (NIA)

Introduction

Innovation is as an instrument for seeking interest and opportunity from various changes to create different business and services from competitors (Drucker, 1985). Innovation is a result of knowledge acquisition, sharing and assimilation through knowledge creation. It is extremely dependent on the availability of knowledge and its complexity created by the explosion of richness and reach of knowledge has to be identified and managed to en-

sure successful innovation (Adams & Lamont, 2003). Therefore, knowledge becomes a key for successful innovative output. According to Saarenketo, Puumalainen, Kuivalainen and Kylaheiko (2009), organizational knowledge and market knowledge become sources of knowledge creation for organization's growth.

According to Nonaka (1994), innovative knowledge can be created through integration between organizational knowledge and market orientation. However, a researcher found that previous studies (Lopez-Nicolas & Soto-Acosta, 2010) are still incomprehensive. They are lacking of studies on integration of both internal and external sources of knowledge creation in a comprehensive view. This makes even more attractive for the purpose of study, since studies conducted are very rare in this field, especially among Thai innovative companies. The focus of this study is on innovative companies located in Thailand. More specifically, the aim of this study is to further the understanding of what factors and their relationship influence the process of knowledge creation.

Literature Review

Overview of Knowledge Creation

Knowledge creation is an integration process through which an organization interacts with individuals and the environment. This interaction makes the knowledge process occur as a dynamic and inter-linked interaction from an individual-to-societal level (Nonaka & Toyama, 2003). The knowledge-based innovation literature explains the role of knowledge in the process of innovation (Quintance, Casselman, Reiche, & Nylund, 2011). Several models of a knowledge-based process of innovation can be found in the literature (Galunic & Rodan, 1998). These models explore the characteristics of knowledge and their impact on the knowledge creation process whose output is implicitly viewed as an innovation. For example, Tsai and Ghoshal (1998) and Tsai (2001) present models of organizational innovativeness that draw a parallel between knowledge creation and innovation. These models highlight the role of various processes of knowledge creation and recombination for the generation of new knowledge that can be considered an innovation. The recombination for the generation of new knowledge is called knowledge integration (Quintance et al., 2011).

Knowledge integration can be categorized into internal integration and external integration. Internal integration focuses on rich coordination, communications and cooperation among team members (Olson, Walker, Ruekert, & Bonner, 2001). Internal integration is mainly related to a firm's ability to collect together and take advantage of all information and knowledge sources available inside the firm (Paolo, 2007) and to reduce the gaps between the thought worlds typical of each functional area (Dougherty, 1992).

In fact, the increase in internal integration helps team members to capture innovative business and market analysis, technical development problems, product testing, and product commercialization (Swink & Song, 2007).

External integration is a strategic approach of the firm aimed at key boundary-spanning initiatives for fostering high-level coordination and communication between a firm, its customers, competitors and suppliers to effectively support product design and development activities (Dröge, Jayaram, & Vickery, 2004). More than ever companies are experiencing the need to develop new products more rapidly to satisfy expanding and changing customer requirements considering new technologies and strengthening global competition (Millson & Wilemon, 2002). Increasing the information and knowledge available at the beginning of the development process is beneficial to reduce market and technological uncertainties, and to boost the possibility of new product success. External integration is related to the ability to gain further information and knowledge by involving external entities in the product development process through network relationships (Paolo, 2007). A firm can enforce and increase the external integration of its process by collecting the information and knowledge needed to achieve substantial reductions in uncertainty during development from well-informed external entities.

The study conducted by Lin and Chen (2008) shows that internal integration and external integration positively influence knowledge creation for the firm innovation. Therefore, we argue that new knowledge creation is created through an integrated process between organizational knowledge and market knowledge.

Assessing Knowledge Creation (KC)

There are not many literatures discussing the dimensions of knowledge creation. Most of the literatures discussed knowledge creation in the form of its tacitness and explicitness. However, some authors have emphasized different dimensions of knowledge creation. Schumpeter (1934) suggested knowledge creation is translated namely into new products and services, new methods of production, and new markets. Miller and Friesen (1983) focused on four dimensions: new products and services, new methods of production, risk taking by key executives and seeking solution. Meanwhile, Capon, Farley, Hulbert, and Lehmann (1992) suggested three dimensions: market, strategic tendency to pioneer and technological advancement. Wang and Ahmed (2004) suggested four dimensions of knowledge creation: products and services, process, market and strategy.

From the above discussion we can conclude that there are four main dimensions to measure knowledge creation, product and service outcome, process outcome, market outcome and strategy outcome. However, this

study excludes strategy dimension because the majority of empirical research does not consider strategy outcome as a component factor of organizational innovativeness (Wang & Ahmed, 2004).

Product Outcome (PO)

Knowledge creation is crucial to new product and service outcome (Yang, 2007). Knowledge creation in products and services allows companies to establish a dominant position in the competitive marketplace, and afford new entrants an opportunity to gain a foothold in the market (Danneels & Kleinschmidt, 2001).

Products developed from new knowledge are most often referred to as perceived newness, novelty, originality or uniqueness of products (Henard & Szymanski, 2001). New product development is dependent on the organization's ability to apply knowledge and information towards the discovery of new products and services (Tannenbaum & Nash, 2002). The new product development and knowledge management processes are of utmost importance, since products that do not adapt to changes in the market knowledge cease to exist (Goldenberg, Lehmann, & Mazursky, 2001). Madhavan and Grover (1998) stated that the central theme for the new product and service development process is the creation of new knowledge.

Process Outcome (PRO)

The discovery of new knowledge can lead to process innovativeness, which captures the introduction of new production methods, new management approaches, and new technology that can be used to improve production and management process (Wang & Ahmed, 2004). Process innovativeness work is mainly driven by the needs of production and can be said to be primarily efficiency-driven (Bergfors & Larsson, 2009). As a result, an organization can exploit their resources and recombine its resources for optimizing the competitive advantage in production. Besides the implementation of new approach, process innovativeness can also lead to the reduction of production costs, higher production yields, improvement of production volumes, product recoveries and environment-friendly production (Larger, 2002).

Market Outcome (MO)

Market outcome refers to the discovery of a new market segment, which is related to market research, advertising and promotion (Andrews & Smith, 1996). The main reasons for a company to enter a new market segment or focus on a particular group of customers are to identify new market opportunities and fulfill a market gap by monitoring market trends. For some companies, this means that they can enter a market or identify a new market

segment and launch products with cutting-edge technological content. Entering a new market segment will increase the company's competitiveness through growth possibilities, value creation and perceived value, profits, increased sales, prices and market shares, better protection from competition, customer retention/loyalty and higher purchase frequency (Toften & Hammervoll, 2013).

Conceptual Framework

Organizational Knowledge (OK)

Organizational knowledge has become an important factor for knowledge creation (Park, Ribiere, & Schulte, 2004) and the most valuable strategic resource for the organization (Takeuchi & Nonaka, 2004). Organizational knowledge refers to the capability of the members the organization has developed to draw distinctions in the process of carrying out their work by enacting sets of generalizations based on collective understandings and experiences (Tsoukas & Vladimirou, 2001). It resides within an organization and can be either in tacit or explicit form.

Organizational knowledge creation has become a new trend of knowledge management study. The internal created knowledge can develop new skills, ideas and uniqueness, which is difficult for competitors to imitate (Nonaka, von Krogh, & Voelpel, 2006). Nonaka (1994) pointed out that if the organization can arrange the process of knowledge creation effectively through sharing knowledge, which is dispersed and embedded in individuals, equipment and routines, it would be a set of successful knowledge management activities to achieve knowledge creation. Hedlund and Nonaka (2008) highlight that creating and exploiting knowledge within an organization revolves around the integration of tacit and explicit knowledge, and the transfer and transformation of knowledge between organizational knowledge and market knowledge. Thus, the creation of new knowledge is essential for the success of the organization to compete in dynamic environments. According to previous studies by several researchers, organizational knowledge can be created through social interaction within an organization (Tsoukas & Vladimirou, 2001), organizational routines (Takeuchi & Nonaka, 2004; Nonaka & Toyama, 2003) and information technology (Nonaka, Toyoma, & Konno, 2000).

Organizational knowledge represents the core element of innovative organization (Inkpen & Tsang, 2005). Innovation generation demands that knowledge is continually renewed and replenished (Brown & Eisenhardt, 1997). The existing organizational knowledge will become an obsolete knowledge and will be replaced by new and integrated one (Takeuchi & Nonaka, 2004). New integrated knowledge is developed through a synthesizing process in which existing organizational knowledge interacts with mar-

ket knowledge (Nonaka & Toyama, 2003). An organization absorbs market knowledge, combines them with pre-existing knowledge, and creates new one (Cohen & Levinthal, 1990). Therefore, we argue that organizational knowledge is influenced by market knowledge.

H1 *Organizational knowledge is positively influenced by market knowledge.*

Social Interaction (SI)

Social relation ties constitute information channels that reduce the amount of time and investment required to gather information (Chua, 2002). The role of network on social relationship was recognized as a critical mechanism for knowledge combination and exchange to further achieve favourable innovation (Nahapiet & Ghoshal, 1998). There are three dimensions related to social interaction among organization members, which include structural, relational and cognitive dimensions (Nahapiet & Ghoshal, 1998).

The structural dimension concerns the properties of the social system and it refers to impersonal configuration of linkages between people of units (Chua, 2002). The structural dimension helps organization members to access desired strategic resources and increases their social interaction through physical means or electronic means (Chua, 2002) in order to be involved in knowledge creation activities (Bell & Jackson, 2001). The relational dimension is the kind of personal relationships. Organization members developed social interaction through the norms of cooperation care and the sense of identification care (Von Krogh, Ichijo, & Nonaka, 2000). Care gives rise to mutual trust, active empathy, access to help and lenient judgment (Von Krogh et al., 2000). Lastly, the cognitive dimension refers to those resources that provide shared representations, interpretations and system of meaning. In the cognitive dimension, organization members discuss and exchange information, ask questions and provide opinion (Nahapiet & Ghoshal, 1998). The cognitive dimension also influences a perception and it also provides a frame of reference for observing and interpreting the environment. Therefore, it facilitates the combination of diversified knowledge mostly in the form of tacit knowledge.

Organizational Routines (OR)

Organizational routines serve as a frame of reference for 'appropriate behaviour' for the members of an organization (Hoeve & Nieuwenhuis, 2006). Organizational routines refer to explicit structure that includes implicit actions as well. Galunic and Rodan (1998) referred to them as tacitly-held and explicitly-held routines to address the fact that routines can be in tacit form and explicit form. An organization needs those routines to be a guideline for

effective work and good quality output. Employees will refer to these organizational routines in completing their tasks and jobs. A study conducted by Tsoukas and Vladimirou (2001) showed that routines in the form of written procedures and manuals makes employees perform their tasks efficiently and effectively. Correspondingly, routines can be seen as part of a learning process leading to continuously improving capabilities (Andreu & Ciborra, 1996). Therefore, routines can be both operational working procedures (explicitly-held-routines) and organizational practices (tacitly-held routines).

Information System (IS)

The development of sophisticated corporate information systems makes an organization retrieve the needed information very quickly and on time. Information systems become one of the critical factors of success in implementing knowledge management (Hasnali, 2002). A study shows that an information system has a significant positive influence on the process of knowledge creation (Lopez-Nicolas & Soto-Acosta, 2010). This study, in small innovative hi-tech companies, showed that the use of information system (IS) assisted in creating new knowledge (Spraggon & Bodolica, 2008). IS represents a valuable tool where individual, group and organizational knowledge are continuously codified, stored, diffused and renewed. It also represents a significant source of organizational learning and knowledge creation. Accordingly, the following hypotheses are proposed.

H2 *Organizational knowledge positively influences knowledge creation.*

H2a *Social interaction positively influences knowledge creation.*

H2b *Organizational routines positively influence knowledge creation.*

H2c *Information system positively influences knowledge creation.*

Market Knowledge (MK)

Market knowledge is not explicit but rather difficult to codify and communicate (Nonaka & Takeuchi, 1995). The prior research shows that the acquisition of market environment leads to short-term improvements in sales and profitability growth, market share, new product success, customer satisfaction and return on assets (Jaworski & Kohli, 1993; Slater & Narver, 1999). According to a knowledge-based view of the firm, external knowledge acquisition from market knowledge becomes one of the critical means for knowledge creation in order to achieve competitive advantage (Nonaka & Takeuchi, 1995; Lavie, 2006). Organizations can acquire information and knowledge from their interactions with a variety of external stakeholders (Ayuso, Rodriguez, Garcia-Castro, & Arino, 2011).

According to the stakeholder theory (Freeman, 1984), stakeholders refer to groups and individuals who can affect or are affected by the organiza-

tion's purpose, which include customers, competitors, suppliers, government, NGOs and communities (Holmes & Smart, 2009). Stakeholders become important players in market knowledge. They are divided into primary and secondary stakeholders. The primary stakeholders are those who are directly involved in a market relationship such as customers, competitors and suppliers. On the other hand, secondary stakeholders, government, NGOs, communities and others, refer to those who are not directly involved in a market relationship (Ayuso et al., 2011). The scope of this study only covers the role of primary stakeholders.

Customer Orientation (CO)

The voice of the customer is deployed throughout the product planning and design stages (Hauser & Clausing, 1988). It will become an input in the product design and development. Customers should be the driving force behind product development. A firm that commits itself to superior customer service and integrates customer preferences and needs into its product development strategy has the best guarantee for long-term success (Gatignon & Xuereb, 1997). Any changes in customers' demands may negatively affect the value of current marketing capabilities.

The literature suggests that the primary objective of an organization is to deliver superior customer value, which is based on knowledge gathered from customer analyses and disseminated throughout the organization (Narver & Slater, 1990). The understanding of customer needs, preferences and market trends enables the organization to identify and develop capabilities for long term performance (Day, 1994), because the organization has information on customers' implicit needs to fulfil their customers' satisfaction.

Competitor Orientation (ComO)

Competitors are defined as organizations or firms offering products or services that are close substitutes, in the sense that they serve the same customer need (Kotler, 2000). Competitors' orientations would provide a solid basis of information pertaining to present and potential competitors for executive actions. It can also enhance a firm's competitive advantage by allowing it to benchmark with, learn from, imitate, and improve the products of successful competitors (Drew, 1997). A considerable body of marketing thought suggests that competitor orientations should improve an organization's performance by enabling the organization to position its strengths against rivals' weaknesses (Slater & Narver, 1999).

Competitors' orientations can be accessed from many sources and they are available in many forms. The more traditional forms of competitors' orientations are based on the assessment of competitors' goal, financial

results, successes and failures, as well as competitors' assumption about a market (Porter, 1980). Besides the traditional forms, an organization can access and analyze competitors through internal employees and sale personnel. They can be a medium of supplying competitors' movements and activities in a market because they are directly involved with substitute products or services. Thus, sufficient information on competitors will guide an organization to take appropriate actions in encountering any strategies or actions implemented by any rivals, which could threaten its business operation (Sørensen, 2009).

Supplier Orientation (SO)

Supplier orientation refers to a supplier who has a clear understanding of the manufacturer's needs and expectations (Gwinner, Bitner, Brown, & Kumar, 2005). To remain competitive in their mainstream markets, an organization must establish a cooperative relationship with suppliers in order to reduce transaction costs associated with 'buy' decision (Verbeke & Tung, 2013; Sudharatna, 2010). The cost of materials and services has become an affecting factor for an organization's cost. If an organization can reduce the cost of input, it will have a competitive advantage over its competitors in terms of cost leadership. Besides the cost of materials and services, the quality of materials supplied should also be taken into consideration for producing quality products (Sudharatna, 2010).

Environmental dynamism may cause obsolescence in an organization's current knowledge base and erode its competitive advantage (O'Reilly & Tushman, 2008). To avoid this damage, organizations need to carry out an explorative learning that enables them to reconfigure their capabilities base (Lavie, 2006). Thus, market knowledge acquisition by an organization may be considered as a key element for explorative learning development (Lavie, 2006). Consequently, the following hypotheses are proposed.

H3 *Market knowledge positively affects knowledge creation.*

H3a *Customer orientation positively affects knowledge creation.*

H3b *Competitor orientation positively affects knowledge creation.*

H3c *Supplier orientation positively affects knowledge creation.*

Research Methodology

Instrument and Measurement

Given the research problem, research questions and research objectives, the most appropriate methodology for this study is survey. The instrument used for collecting the research data was questionnaires. The questionnaire was developed based on the instruments used by previous researchers. Except for demographic information, perceptual measures in the form of

statements were used for measuring each variable. For each statement, a corresponding Likert scale anchored as 1 for 'Strongly Disagree;' 2 for 'Disagree;' 3 for 'Neither Agree nor Disagree;' 4 for 'Agree' and 5 for 'Strongly Agree' was provided. The respondents are requested to respond to each of the statements by marking these scales. Prior to pilot testing and main data collection, the questionnaires were pre-tested with several experts in the field and also several innovative companies who could become prospective respondents. During the pre-testing exercise, the experts and the prospective respondents were requested to make constructive comments in various respects such as sentence structure, wordings, format, length and language used. Based on their feedbacks, the questionnaire was refined and revised accordingly. Subsequently, the questionnaire was pilot tested with 40 innovative companies. Using the IBM SPSS version 20, the responses of these 40 companies were analyzed by assessing the reliability of the measurements. The recorded Cronbach Alpha for all variables employing multi-items were well above 0.6, which suggested that the questionnaire was reliably sound (George & Mallery, 2003; Kline, 2005).

Population, Sampling and Data Collection

The population of the study was Thai innovative companies registered under the National Innovation Agency of Thailand (NIA) from 2004–2014. Those companies were chosen because of the researcher's easy access to the sampling frame. A total of 464 companies was identified as targeted respondents. Those companies were divided into three categories: 119 eco-industry companies, 236 design and solution companies and 109 bio-business companies. Research assistants among the students were engaged to distribute the questionnaire. The duration of data collection was three months. After the three months period was over, a total of 217 questionnaires were returned. However, 6 were found to be incomplete and 2 questionnaires were outliers for further analysis. The remaining 209 were analyzed using IBM SPSS and AMOS version 21. The statistical analyses carried out were frequency analysis; descriptive analysis focusing on median, standard deviation, variance and testing normality of distribution; exploratory factor analysis (EFA) for assessing unidimensionality; confirmatory factor analysis (CFA) for assessing the convergent validity and discriminant validity; and structural equation modelling (SEM) or structural model for testing the established hypotheses.

Findings

Respondents' Characteristics

Table 1 presents the demographic profiles of the respondents. Out of 209 respondents, the majority were companies located at the central zone

Table 1 Demographic Profile

Category	Group	Number	Percentage
Designation	Company owner	98	46.89
	R&D manager/head	111	53.11
Duration	Less than 5 years	81	38.76
	Less than 10 years	30	14.35
	More than 10 years	98	46.89
Types of companies	Eco-industry	93	44.50
	Design and Solution	72	34.45
	Bio-technology	44	21.05
Zone	Central	155	74.16
	North	14	6.70
	East	6	2.87
	Northeast	15	7.18
	West	1	0.48
	South	18	8.61
Employees	Less than 50	123	58.85
	50–200	44	21.05
	More than 200	42	20.10

(74.16%), while the minority was located in the west zone (0.48%). In terms of company size, the majority of respondents were small companies (58.85%) which have less than 50 employees. Concerning the company categories, 44.50% was eco-industry, 34.45% was design and solution, and 21.05% was bio-technology. Concerning the respondent's designation, 53.11% was R&D manager and 46.4% was company owner.

Assessment of Common Method Effect

Considering that all data in this study were self-reported and collected using the same questionnaire during the same period, the problem of having common method variance is quite possible. Podsakoff, MacKenzie and Bommer (2003) described that common method variance may cause systematic measurement errors and further bias the estimates of the true relationship among theoretical constructs. Common method variance is considered a major problem and a threat to the validity of the results if one factor accounts more than 50% of the variance in the dataset (Podsakoff & Organ, 1986). To cater this effect, the Harman's single factor test was executed. According to this test, if the result for factor analysis indicates a single factor or if any general factor accounts for more than 50% of the

Table 2 Univariate and Multivariate Normality

Variable	(1)	(2)	(3)	(2)
Market Outcome	-0.029	-0.172	-0.397	-1.170
Process Outcome	-0.335	-1.979	0.588	1.735
Product Outcome	-0.539	-3.179	0.158	0.466
Customer Orientation	-0.596	-3.519	0.095	0.280
Competitor Orientation	-0.501	-2.958	-0.038	-0.113
Supplier Orientation	-0.369	-2.180	0.104	0.307
Social Interaction	-0.473	-2.791	-0.134	-0.395
Organizational Routines	-0.585	-3.455	0.787	2.324
Information System	-0.468	-2.765	0.008	0.023
Multivariate			16.516	8.484

Notes Column headings are as follows: (1) skew, (2) composite reliability, (3) kurtosis.

covariance of the independent and dependent variables, this indicates the presence of a substantial amount of common method variance. All items from all constructs of the study were entered for analysis and constrained to a single factor. The results show that the single factor explained only 26.85% of the total variance, hence suggesting that the collected data is free from the threats of common method variance.

Assessment of Univariate and Multivariate Normality

The execution of SEM analysis requires that the observed data to be normally distributed. To meet this requirement, univariate normality and multivariate normality were assessed using several procedures. To test for univariate normality, the skewness and kurtosis of each observed variable were assessed. Kline (2005) stated that skew and kurtosis indices should not exceed an absolute value of 3 and 10 respectively. As shown in Table 2, the skewness and kurtosis requirements fulfilled the benchmark values suggested by Kline (2005). To assess multivariate normality, Bollen (1989) suggested that the Mardia's coefficient should be less than $p(p + 2)$, where p is the number of observed variables. Taking into account that the model in this study has 36 observed variables, so $36(36 + 2) = 1368$. The AMOS output for Mardia's coefficient is 16.516, which is less than 1368; hence, multivariate normality is fulfilled.

Validity Assessment

Validity was assessed in terms of convergent validity and discriminant validity. Convergent validity is the extent to which the scale correlates positively with other measures of the same constructs (Malhotra, 2002). Convergent validity can be evaluated by examining the t -value from CFA (Kaynak, 2003; Chen, Pauraj, & Lado, 2004; Sila & Ebrahimpour, 2005; Kim, 2010). Following Anderson and Gerbing (1988), coefficient for each item on its underlying

Table 3 Factor Loading, Standard Errors and t-Values

Constructs	Factors	(1)	(2)	(3)	(4)
Org. Knowledge	Social Interaction	1.000	0.603	–	–
	Organizational Routines	1.116	0.602	0.191	5.842
	Information System	0.984	0.690	0.150	6.560
Market Knowledge	Customer Orientation	0.910	0.744	0.100	9.100
	Competitor Orientation	1.163	0.738	0.128	9.086
	Supplier Orientation	1.000	0.737	–	–
Knowledge Creation	Product Outcome	1.000	0.640	–	–
	Process Outcome	1.242	0.825	0.156	5.288
	Market Outcome	0.970	0.691	0.122	7.950

Notes Column headings are as follows: (1) factor loading, (2) standardized loading, (3) standard error, (4) t-value.

construct was observed. An instrument has convergent validity if the correlations between measures of the same construct using different methods are high (Crocker & Algina, 1986). In measurement studies, each item in the scale can be considered a different method for measuring the construct (Ahire, Golhar, & Waller, 1996). A test of each item's coefficient was used to assess convergent validity. If coefficient for each item is twice greater than its standard error (*t*-value), then measures indicate high convergent validity (Krause, 1999). In other words, the *t*-value should be greater than two to achieve strong convergent validity. The *t*-value of each retained item is presented in Table 3. All *t*-values are significant indicating high convergence validity.

Besides assessing the convergent validity, the study also evaluated the discriminant validity. According to Malhotra (2002), discriminant validity is the extent to which a measure does not correlate with other constructs from which it is supposed to measure. To test the discriminant validity, three approaches were used. The first approach was to perform a chi-square difference test on all pairs of constructs via CFA (Bagozzi, Yi, & Phillips, 1991; Kim, 2010).

Alternatively, the second approach was to compare the Cronbach's Alpha of a construct and its correlations with other constructs (Kaynak, 2003; Kim 2010). According to the rule of thumb, discriminant validity can be achieved if the Cronbach's alpha is greater than the correlations (Sila & Ebrahimpour, 2005). The third approach, proposed by Fornell and Larcker (1981), is using AVE. To examine this effect, the discriminant validity of the construct is determined by comparing the square root of AVE of the variables with the correlation between the variables and all other variables. The second approach was used to test discriminant validity of this study. As displayed in Table 4, the Cronbach's α of the variables is well above the correlation values; hence, suggesting good discriminant validity.

Table 4 Discriminant Validity Assessment Using Cronbach's α

	SI	OR	IS	CO	ComO	SO	PO	PRO	MaO	α
SI	1.000									0.729
OR	0.410	1.000								0.827
IS	0.445	0.331	1.000							0.850
CO	0.312	0.381	0.295	1.000						0.843
ComO	0.242	0.279	0.290	0.554	1.000					0.865
SO	0.335	0.381	0.306	0.542	0.544	1.000				0.847
PO	0.252	0.164	0.205	0.265	0.348	0.258	1.000			0.708
PRO	0.377	0.283	0.308	0.412	0.440	0.334	0.513	1.000		0.716
MaO	0.288	0.256	0.175	0.342	0.351	0.255	0.501	0.557	1.000	0.713

Table 5 Fit Indices of Measurement and Structural Model

Fit index		(1)	(2)
Chi square (χ^2)			28.192
Degree of freedom			24
<i>p</i> -value (probability)		≥ 0.5	0.252
Absolute fit measures	MIN (χ^2)/df	3	1.175
	GFI (Goodness of Fit Index)	≥ 0.9	0.971
	RMSEA (Root Mean Square Error of Approximation)	≤ 0.05	0.029
	RMR (Root Mean Square Residual)	≤ 0.05	0.014
Incremental fit measures	NFI (Normed Fit Index)	≥ 0.9	0.952
	CFI (Comparative Fit Index)	≥ 0.9	0.992
Parsimony fit measures	AGFI (Adjusted Goodness of Fit Index)	≥ 0.8	0.945
	PNFI (Parsimonious Normed Fit Index)	≥ 0.5	0.635

Notes Column headings are as follows: (1) fit criteria, (2) measurement model.

Assessment of Overall Model Fit

The first thing many researchers look for upon obtaining the results of the SEM analysis is the output related to goodness-of-fit (Bowen & Guo, 2012). As illustrated in Table 6, the χ^2 statistics suggests that the data do not fit the model well ($\chi^2 = 28.192$, $df = 24$, $p < 0.5$). However, χ^2 is easily affected by sample size (Gerbing & Anderson 1985). The χ^2 statistic is not always an appropriate measure of a model's goodness-of-fit. Therefore, other fit indices as shown in Table 5 are used to examine the model's goodness-of-fit. Apparently, all of the recorded indices surpassed the fit criteria suggesting that the SEM model fits the data very well.

Structural Model and Hypotheses Testing

The Squared Multiple Correlation (R^2) value for the relationship between the six variables and knowledge creation was 0.49 suggesting that 49 percent

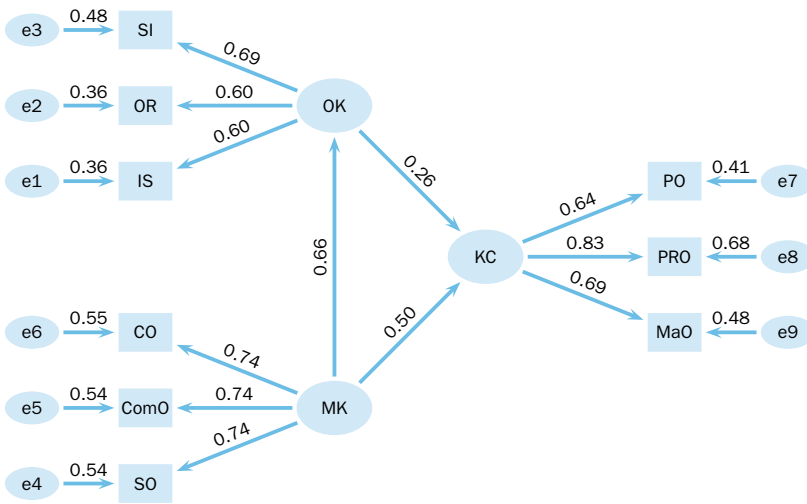


Figure 1 Structural Model

Table 6 Results of Hypotheses Testing

Hypothesis	p-value	Supported
H1: Market knowledge (MK) Organizational knowledge (OK)	< 0.01	Yes
H2: Organizational knowledge (OK) Knowledge creation (KC)	< 0.05	Yes
H2a: Social interaction (SI) Knowledge creation (KC)	< 0.01	Yes
H2b: Organizational routines (OR) Knowledge creation(KC)	< 0.01	Yes
H2c: Information system (IS) Knowledge creation (KC)	< 0.01	Yes
H3: Market knowledge (MK) Knowledge creation (KC)	< 0.01	Yes
H3a: Customer orientation (CO) Knowledge creation (KC)	< 0.01	Yes
H3b: Competitor orientation(ComO) Knowledge creation (KC)	< 0.01	Yes
H3c: Supplier orientation (SO) Knowledge creation (KC)	< 0.01	Yes

of the variance in knowledge creation can be explained by the combination of social interaction ($\beta = 0.248, p < 0.01$), organizational routines ($\beta = 0.36, p < 0.01$), information system ($\beta = 0.36, p < 0.01$), customer orientation ($\beta = 0.55, p < 0.01$), competitor orientation ($\beta = 0.54, p < 0.01$) and supplier orientation ($\beta = 0.54, p < 0.01$). The overall results summarized in Figure 1 and Table 6 indicates that all hypotheses were fully supported.

Discussion

The results of the current study provided additional evidence in support of previous findings that organizational knowledge is significantly influenced by market knowledge. The findings support the knowledge base view (KBV), which stated an organization should synthesize both organizational knowl-

edge and market knowledge for competitive advantage. An organization may integrate its pre-existing internal knowledge in the firm with market knowledge (Szulanski, 2003), as these new combinations generate new innovative knowledge (Gratton & Ghoshal, 2003). According to Nonaka and Toyama (2003), knowledge is created through the synthesis of thinking and actions of individuals. The theory of knowledge creation is based on an idealistic pragmatism, which synthesizes the rational pursuit of appropriate ends. The importance of exchanging and recombining knowledge resources (broadly speaking, the know-how of the firm) has been highlighted in previous works (Nonaka & Takeuchi, 1995; Conner & Prahalad, 1996).

The primary influences of organizational knowledge on knowledge creation as identified by Blayse and Key (2004) are social interaction, organizational routines and information system. The results of the study showed consistency with those researchers. All factors of organizational knowledge are statistically significant. The study showed that social interaction was the most influential factor on knowledge creation. This finding supports the studies of Lee and Choi (2007) and Von Krogh et al. (2000).

The study also showed that organizational routines significantly influenced knowledge creation, which was consistent with the studies conducted by Hoeve and Nieuwenhuis (2006) of a bakery factory in Holland, and Raven (1999), who studied an American company and a Swedish company. The analysis also supported the findings of a study in Zain Company conducted by Al-Gharibeh (2011), which showed that an information system significantly influenced knowledge creation. It indicates that technological advancement is a major source of improvement in the competitiveness of the firms and industries and subsequently increases the national growth and standard of living in a country (Gold, 1981).

The finding from the study also showed that all factors of market knowledge, customer orientation, competitor orientation and supplier orientation have an impact on knowledge creation. Statistically, customer orientation has more influence on knowledge creation than competitor orientation and supplier orientation. This finding was consistent with several previous studies (Kristensson, Matthing, & Johansson, 2008; Rowley, Kupiec-Teahan, & Leeming, 2007).

Conclusion

While this study has successfully achieved its objectives, it is however not without some limitation. Several possible limitations are worth noting in this study. Because the original measurement model was revised, it may not have measured the latent variables in the manner originally intended by the developers of the instruments. The fit measures and the psychometric properties of the original model needed to be reviewed. One reason

for the poor fit of the model to the data could be that the population of this study may have been significantly different with respect to the variables researched. Although the instruments in this study showed adequate psychometric properties, the study results using the revised factor structures were limited to the population and setting studied. Future research could replicate the study using a different population to shed more light on the underlying structure of the study constructs.

The implications of this research can be viewed from both theoretical and practical perspectives. From the theoretical viewpoint, the study has developed an empirical based framework that depicts critical factors influencing knowledge creation. Researchers specializing on the assessment of knowledge creation can consider adopting the framework for future studies. Alternatively, the framework can be further extended by other variables, such as variables that have indirect relationships in a market. From the practical viewpoint, the instrument that has been developed can be used as a diagnostic tool for continuous improvements of knowledge creation.

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