

The Impact of Knowledge Management on Organizational Innovation: An Empirical Study

Kambiz Abdi¹ & Aslan Amat Senin¹

¹ Department of Business Administration, Faculty of Management, Universiti Teknologi Malaysia, Johor, Malaysia

Correspondence: Aslan Amat Senin, Department of Business Administration, Faculty of Management, Universiti Teknologi Malaysia, 81310 skudai, Johor, Malaysia. E-mail: aslan@utm.my

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Abstract

The character of organizational innovation is considered significant for developing and improving the related products, procedures and marketplaces, for adding value as well as effectiveness over administrations. The innovation procedure is necessary regarding the activity of an association as the capability for innovation is important for attaining and sustaining competitive advantage. The absence of empirical investigations about the consequence of knowledge management on organizational innovation by organizational learning particularly over the developing countries exists in the related literature. The key objective of the current investigation is to evaluate the consequence of knowledge management on innovation directly and over organizational learning in Iranian automotive industry namely Iran Khodro Company. A total of 272 managers were chosen from systems and methods as the participants of the current study. The data were analysed using the Structural Equation Modelling (SEM). Results of the study revealed that there is an influence of knowledge management on organizational innovation in Iranian automotive industry. Results of the investigation showed that organizational learning has an important character as a mediator on the association between knowledge management and organizational innovation.

Keywords: knowledge management, organizational innovation, organizational learning

1. Introduction

Due to the fast improving technology and slowly globalizing marketplace, knowledge management (KM) is longer measured a suitable plan in this extremely competitive commercial contexts. Currently, businesses should have a competition regarding their survival in several continuous for improving and innovating the competitive advantages (García-Morales et al., 2006). In the other words, businesses should have innovation for obtaining chances for their survival reasons. Meanwhile, confrontation to innovation is probable to result in initiatives of declining performance. Globalization caused openness for the trade markets all over the world that carry business chances which have never been considered before. On the other hand, globalization likewise opens the door to tough competitions in several businesses. As Drucker (2007) believes, KM have been considered as the most important advantage in the knowledge-based culture. Consequently, KM are a considered as important constituent of commercial achievement, and actual policies for nonstop improving innovation and activity in business. Innovation is extremely related to the availability of knowledge and therefore the trouble shaped through the outburst of wealth and knowledge convenience should be identified and focused for certifying victorious innovation (Adams & Lamont, 2003; Cardinal et al., 2001). Knowledge refers to a strategic advantage which aids associations for maintaining their competitive capability in a turbulent context. The achievement of organizations thus is built upon administrations' and persons' speed in learning. Organizations striving in today's fast-changing market are confronted the need to have workers that know how to study and quickly retool and be ready for novel problems (Hurmelinna-Laukkanen et al., 2008).

According to the problem statement lack of studies implemented on these subjects is even more evident in the automobile industry background, in that there are merely a few investigations focused on the association between organizational learning (OL) and organizational innovation (OI). Furthermore, in agreement with (Liao & Wu, 2010), who recommended that few comprehensive investigations inspected concurrently the association among, KM and OL on several kinds of OI, e.g. technological versus administrative innovation, incremental

versus radical innovation, and product versus process innovation over mediating effect of OL. The current investigation tries to examine the following research questions:

- 1) Does the KM relate to OI?
- 2) Does KM affect the OL?
- 3) Is OL holding any connectivity with OI?
- 4) Does the KM relate to OI with mediation of OL?

Contribution of the study: The outcomes of the investigation can clarify the character of OL and its consequences on the OI. Several researchers did investigations in this regard to comprehend the associations among KM, OL, and OI discretely, and few investigations focused on the variables into account at the same time (Liao & Wu, 2010; Moustaghfir & Schiuma, 2013). According to the introduction and aim of the study, current paper comprises background of investigation, proposed conceptual framework, hypotheses of the study, methodology and conclusion.

2. Background of Study

Several academics and practitioners believed that KM should ease making novel knowledge for making an organization more innovative and competitive (Burton-Jones, 2001; Joshi et al., 2010; Kearns & Sabherwal, 2007) consequently, acquiring knowledge positively in management procedures influences OI. Nowadays, the business goals have initiated to focus on varying capitals to obtain new knowledge to maintain sustained competitive advantages. Regardless of that, an increasing amount of investigations concluded that KM might contribute in having an important character to improve innovation (Rhodes et al., 2008). Consequently, for gaining novel knowledge, companies focus on pursuing several capitals to assert sustained competitive advantage. Henceforth, in today's business management, KM is considered as an important matter (Shenbagavalli, 2013). A review of related literature displays that KM and knowledge are problematic and multifaceted ideas (Becerra-Fernandez & Leidner, 2008). Liao and Wu(2010) investigated the associations amongst KM, OL and innovation. The results showed that the learning of association works as the interceding variable between OI and KM. Additionally, they supposed that like a system, KM is an important input, and OL is the main procedure, after that OI is a vital output.

Al-Hakim and Hassan (2013) the management of knowledge is regularly recognised as a significant antecedent of innovation. Effective KM was discussed in the previous studies as one approach for developing innovation and performance. Though several investigations have stated that KM is referred as backgrounds of innovation, none has directly evaluated the association between the two concepts. Therefore, KM procedure would positively influence innovation. Though, learning of organization is circulated with KM (García-Morales et al., 2006), and the connotation amongst OL and KM is not clear (Hu, 2010). Based on the related literature, several researchers conducted the investigation to understand the relationship among OI, OL and KM separately (Liao & Wu, 2010). The outcomes show that both variables OI and learning add positively to the performance of business, and that innovation is affected by OL.

During the current study, the knowledge-based theory (KBV) is considered as an appropriate theory for supporting the conceptual framework. The association amongst KBV and OI is important for association due to the essentiality of KM about innovation requires that it brings a scaffold in favour of the management in their attempt of developing and making organizational competence towards novelty (Candra, 2014). Therefore, OL as an intangible asset and its consequence on OI is perfectly consistent with the KBV (Vasenska, 2013).

2.1 Knowledge Management

KM is considered as several procedures to understand and apply knowledge strategic capitals in an association. It is considered as the structured method that offers approaches for recognizing, evaluating, organizing, storing & applying knowledge in order to meet the requirements and objectives of the association. KM is a procedure in that associations can identify, choose, establish, allocate and convey important information and involvements that would be applied in events like problem resolution, dynamic education, strategic programming and decision making (Choi & Lee, 2002; Hansen et al., 2000; Zack, 2002). Nowadays, KM is referred as the key basis of competitiveness. This does not mean that in the current competitive context, KM may not be applied to obtain competitive advantage, achieving goals & being inspired, but conclusively it might be appealed that today KM skills might be applied for entering inventiveness in associations. Nowadays by using the KM a set of procedures for formation and use of strategic knowledge capitals in association might be made (Chou, 2005; Nonaka & Von Krogh, 2009). It is significant to know that the KM system is accessible at the right time to the right peoples who need those information, and be offered to them in an arrangement which enables their use of the information

(Rowland et al., 2004). In a simplistic sense, KM has two roles: it is considered as a basis of knowledge and an organizer for educating, developing, and using knowledge at both the development organizational levels (Apostolou & Mentzas, 1999; Milam, 2005). Based on Lawson (2003), plans and procedure used for recognizing, seizing, constructing, valuing, leveraging, and allocating the intellectual possessions of an association to develop its competitiveness and performance.

2.2 Organization Learning

The accepted significance of learning orientation all over the world is very clear. There are numerous important procedures associated to learning where per business might recover itself, these comprise knowing the client requirements, be more knowledgeable regarding the variations of an external context for the timely improving of the essential abilities for coping with the novel necessities (Vasenska, 2013). Innovation refers to creating, acknowledging and executing the novel thoughts, procedure, properties or facilities. It is a worldwide fact that learning orientation and company's innovation is so strictly associated to each other that intellectuals recommend that association should give learning to its workers regarding the significance of innovation. OL is being considered as one of the strategic instrument of recording long-term accomplishment of an association (Argote, 2013; Easterby-Smith & Lyles, 2011; Liao & Wu, 2010). From a tactical perspective, OL is being believed as a basis of heterogeneity among associations, in addition to the basis intended regarding a possible competitive advantage (Vera & Crossan, 2004). Nowadays, spirited market, it is important for a commercial for sustaining its place in a rapidly changing context. OL is a process related with the growth of innovative knowledge (Huber, 1991), so, have an outcome on OI, as creating the knowledge develops the preface of novel facilities and crops (Smith et al., 2005). Because of the comprehensive procedure of novelty, the learning has permitted the application of novel impression, product and procedure, novel management styles over the communication and marketing, structural structure and associations with customers (Camarero & Garrido, 2011). Similarly, Phromket and Ussahawanitchakit (2009) has likewise found that OL has optimistic effect on innovation consequence and export activity.

2.3 Organization Innovation

Innovation permits organizations to the parallel progresses of the changes flourishing in the context. It's a tactical point in replying to the novel variations of a context with lots of doubts (Hurmelinna-Laukkanen et al., 2008). Regarding an association, novelty would signify the making or adopting the new thoughts or performance. Over the previous studies, the notion that innovation is vital for companies' long-term achievement and survival establishing a competitive tool is extensively documented. As it is denoted over the investigation done by Amabile et al. (1996) and innovation is identified as the doors opening to both global and international competitive advantage over: improving the market with novel or exclusive products/amenities; making entry obstacles which improve the essential capitals to improve innovation over learning; and making novel values which redesign the directions of competitive setting (Cooper, 1998). A deep investigation about innovation literature displays that several descriptions of innovation are existing from several viewpoints. Innovation also defined as; the acceptance of an inside made or purchased device, scheme, strategy, program, procedure, product, or amenity which is not essentially novel to the world but precisely novel for that accepting association (Cooke, 2001; Marins, 2008). Extracted from the Davila et al. (2012), Innovation like several functions of industry. The learning competences of an association play an important share in creating innovations (Sinkula et al., 1997). Innovation involves the make, support, and performance of fresh thoughts, procedures, amenities or goods. It is crystal clear that learning of association is strongly related with OI (Weerawardena et al., 2006).

2.4 Research Model

The basis of the current investigation is to examine the consequence of KM on OI directly and over mediating variable OL. In the current investigation, an investigation model was offered and empirically verified. The KBV of company are used as the chief theoretical framework for predicting and interpreting the association between variables. Figures 1, 2, and 3 show the model that contains three constructs, namely, KM, OL, and OI.

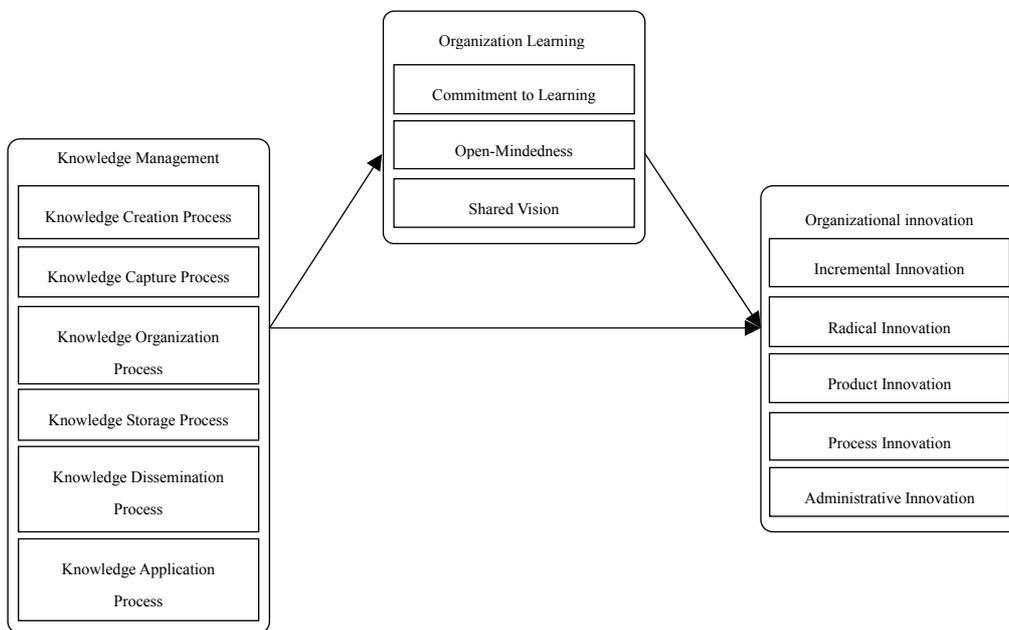


Figure 1. Conceptual framework

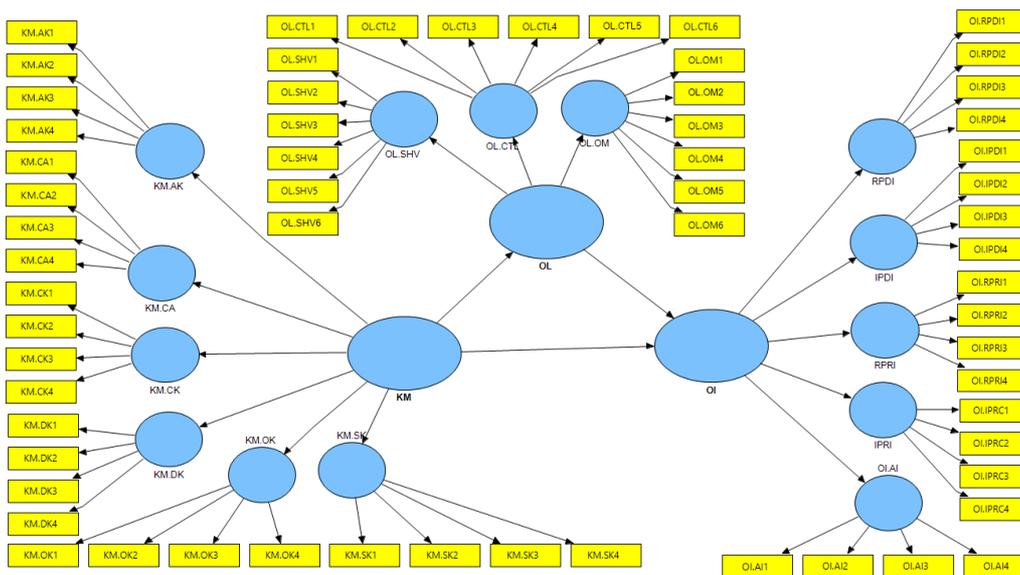


Figure 2. Detailed research model

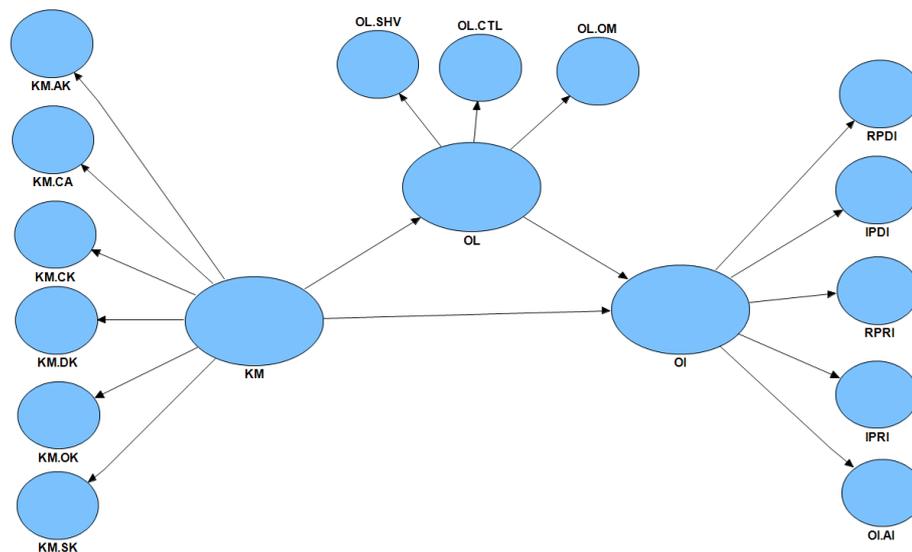


Figure 3. Detailed research model

According to the proposed conceptual framework, following four hypotheses have been employed.

H1: KM has a positive effect on OI.

H2: KM has a positive effect on OL.

H3: OL has a positive effect on OI.

H4: OL mediates the relationship between KM on OI.

3. Methods

The hypotheses of this paper have been developed with the help of supporting theory. This study chooses survey with questionnaire that allows hypothesis testing and generalizing findings. On the basis of previous empirical studies and literature review, questionnaire has been developed. Therefore, a questionnaire based survey was conducted to furnish ample evidence for potential moderating factors. This study can be classified as a cross-sectional study, since it measures the relationship between OL, OC and OI within a particular time period.

3.1 Sample

The target populations selected for this research is auto parts manufacturing of one of the largest car manufacturer company in Iran namely IKCO. According to the statistics of the company, 850 employees in the company that are classified in three groups namely, metallic, electrical and polymer are based on the requirements of automotive industry. As a result, the sampling frame for the current study includes a variety auto parts manufacturer. The systems and methods managers are surveyed as respondents. The sample size using probability random sampling method is estimated to be 272 shown in Table 1. Sample size was designed to be adequate to fulfil the Smart PLS analysis requirements. The stratified random sampling method was used for gathering quantitative data, because the stratifying criterion help researcher to be ensure that the resulting sample was distributed in the same way as the population (Bryman & Bell, 2007).

Table 1. Distribution of the sample size based on the size and type of industry

Sub-Sector	Frequency	Distribution of Sample frame based on the industry type and firm size			Sampling size
		Small	Medium	Large	
Electric	81	33	28	20	81
Metallic	114	45	41	28	114
Polymer	77	29	24	24	77
Total	272	108	92	72	272

3.2 Survey Procedure

An empirical study that is quantitative in nature was conducted in three different groups of Iranian auto parts manufacturers. In the present study, the survey questionnaire method for data collection is selected, which is defined as a predefined set of written closed structure or open-ended items filled by the respondents (Imran et al., 2011). Specifically, the self-administered questionnaire is adopted as the primary source of data collection in this study. The choice of data collection method in survey research is important because of the time, cost and quality of the collected data. A survey questionnaire is developed in this study following the steps of content and operational-items relevant to the objective of the research, along with proper wording and layout management (Imran et al., 2011). Data were collected and analysed in two waves. The first was a pilot study performed to analyse the reliability and validity of newly developed measures. Factor analysis and Cronbach's α results indicated acceptable validity and reliability of all study measures. Thus, the pilot study data were combined with the second wave of data, which was collected approximately 2 months after the pilot study data.

3.3 Measures

Except for demographic variables, Perceptual measures with a seven point Likert scale are used to measure response. All study items were assessed using 7-point Likert scales (e.g., strongly disagree 1, strongly agree 7).

3.3.1 Measures-KM

Andreeva and Kianto (2011) mentioned that KM is a crucial factor in a firm to react rapidly to change, to establish new markets, to create new products quickly, and to be successful in competition and innovation. Six dimensions have been determined as components of KM in this research. These components are: knowledge creation process, knowledge capture process, knowledge organization process, knowledge storage process, knowledge dissemination process, knowledge application process (Lawson, 2003). The scale questionnaire consisted of 24 items which considered to KM 4 questions for each of 6 dimensions.

3.3.2 Measures-OI

The innovation process is essential to the performance of organization (Marins, 2008). In this study, five distinct dimensions of OI were examined that namely radical product innovation, incremental product innovation, radical process innovation, incremental process innovation and administrative innovation (Cheng & Shiu, 2008). The scale includes a list of 20 items 4 questions for each of 5 dimensions.

3.3.3 Measures-OL

OL enhances an organization's abilities in order to propagate and apply knowledge to be adapted with changes of external environment. Three dimensions of OL were examined as the mediating variable components in this research. These dimensions are commitment to learning, shared vision and open-mindedness (Tobin, 1993). The scale includes a list of 18 questions for assessing OL construct and 6 questions for each of 3 dimensions.

3.4 Limitations of the Methods

The use of single-source data raises questions regarding common method bias. we employed multiple procedural remedies suggested by (Podsakoff & Organ, 1986) to limit this bias, including ensuring respondents' anonymity, randomizing the order of presentation of survey items as well as conducting a Harman's (1976) single-factor test to assess if any issue regarding common method bias exist. Common method bias or common method variance refers to the circumstances where a single factor account for a majority of the variance, and a general factor would be apparent (Podsakoff & Organ, 1986). Common method variance may be of problem and this problem has its roots in the self-reported nature of the data. To remedy a problem of common method bias/variance, data needs to be tested using a Harman's (1976) single-factor test (Podsakoff & Organ, 1986). Harman's single-factor test involves analysing all variables in an exploratory factor analysis and examining the unrelated factor solution. Data were applied to IBM SPSS factor analysis procedure and this time only a single factor was extracted. The results shows that 19 Eigenvalues are above 1.0 and using principal axis factoring without rotation, the single forced factor accounts for only 24.24% of the overall variance. Since the percentage is below 50%, therefore, an existence of no general factor is evident and hence common method bias/variance is not an issue for further analysis in this study.

4. Results

This study used a variance-based partial least squares (PLS) approach or so called partial least squares structural equation modelling (PLS-SEM) that is a second generation multivariate technique (Fornell & Cha, 1994). A software called Smart PLS M3 version 2.0 (Ringle et al., 2005) has been used for data analysis purposes. The reason to use PLS-SEM is based on the main aim of this study as to identify and investigate a model in which OI

is explained by KM and learning. In circumstances where the focus is on overall prediction of a model, a prediction-oriented or variance-based PLS-SEM approach is particularly suitable (Henseler et al., 2012; Henseler et al., 2009). Furthermore, due to complexity of the model which could cause series of problem for covariance-based techniques, PLS-SEM approach has been employed in this study. In fact, PLS algorithm is established on a series of ordinary least squares regressions (OLS) whereby PLS-SEM as a robust technique can easily handle complex models and non-normally distributed data (Klarner et al., 2013). The analysis should be carried out on the basis of the path weighting scheme (Henseler et al., 2012; Henseler et al., 2009). This study uses recent guidelines provided by Chin (2010), Gil-Garcia (2008), and others (Hair et al., 2013; Hair et al., 2011; Hair et al., 2012, 2013; Hair et al., 2012; Hair et al., 2012).

PLS-SEM as a second generation multivariate technique (Fornell & Cha, 1994) is capable of carrying out a simultaneous evaluation of the measurement model (the relationships between constructs and their corresponding indicators), and the structural model with the aim of minimizing the error variance (Chin, 1998a; Gil-Garcia, 2008). As recommended by given authors, a measurement model analysis should be carried out prior to evaluation of a structural model. At this stage, the goodness of measures was established through convergence validity, discriminant validity, and composite reliability. Finally, a bootstrapping methods with 3,000 re-samples should be run to determine the significance levels for loadings, weights, and path coefficients (Chin, 1998b; Gil-Garcia, 2008).

4.1 Measurement Model

Convergent validity: is the degree to which multiple items to measure the same concept are in agreement. As suggested by Hair et al. effect (2013) factor loadings, composite reliability and average variance extracted have been used to assess convergence validity. The recommended values for loadings are set at > 0.5, the average variance extracted (AVE) should be > 0.5 and the composite reliability (CR) should be > 0.7. Figure 4 directs that all three constructs in the model are conceptualized as second order constructs. Thus this study followed the method suggested in the literature in PLS which is the repeated indicator approach to model the second order factors in the PLS analysis (Hair et al., 2013). Table 2 Measurement Model indicates that the results of the measurement model exceed the recommended values thus indicating sufficient convergence validity. Hence, all items for given constructs have been remained in the model for further analysis except for capture knowledge. One item from capture knowledge (KM.CA2) was removed because of loading less than 0.7.

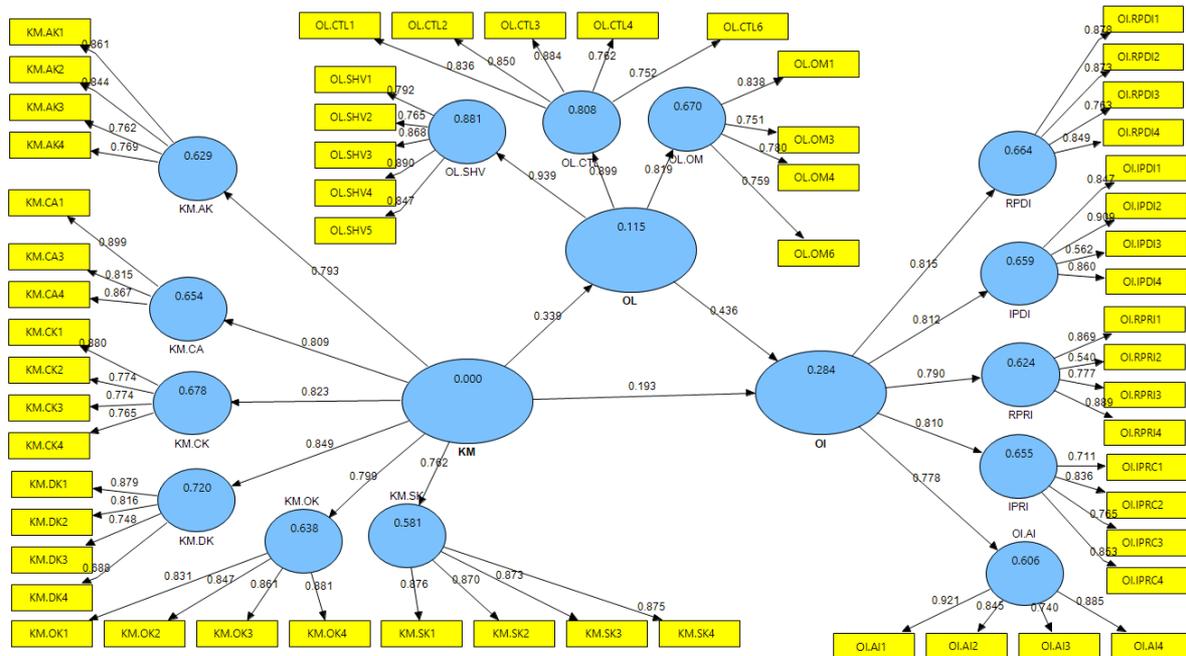


Figure 4. The result of measurement model

Table 2. Measurement model

First-Order Constructs	Second Order constructs	Items	Loadings	AVE ^a	CR ^b
KM: Application Knowledge		KM.AK1	0.861	0.656	0.884
		KM.AK2	0.844		
		KM.AK3	0.762		
		KM.AK4	0.769		
KM: Capture Knowledge		KM.CA1	0.899	0.742	0.896
		KM.CA3	0.815		
		KM.CA4	0.867		
KM: Creation Knowledge		KM.CK1	0.880	0.639	0.876
		KM.CK2	0.774		
		KM.CK3	0.774		
		KM.CK4	0.765		
KM: Dissemination Knowledge		KM.DK1	0.879	0.618	0.885
		KM.DK2	0.816		
		KM.DK3	0.748		
		KM.DK4	0.688		
KM: Organization Knowledge		KM.OK1	0.831	0.732	0.916
		KM.OK2	0.847		
		KM.OK3	0.861		
		KM.OK4	0.881		
KM: Storage Knowledge		KM.SK1	0.876	0.763	0.928
		KM.SK2	0.870		
		KM.SK3	0.873		
		KM.SK4	0.875		
KM ^c		Application Knowledge	0.793	0.65	0.917
		Capture Knowledge	0.809		
		Creation Knowledge	0.823		
		Dissemination Knowledge	0.848		
		Organization Knowledge	0.798		
		Storage Knowledge	0.763		
OI: Administrative Innovation		OI.AI1	0.921	0.723	0.912
		OI.AI2	0.845		
		OI.AI3	0.740		
		OI.AI4	0.885		
OI: Incremental Product Innovation		OI.IPDI1	0.847	0.650	0.878
		OI.IPDI2	0.909		
		OI.IPDI3	0.562		
		OI.IPDI4	0.860		
OI: Incremental processes Innovation		OI.IPRC1	0.711	0.630	0.871
		OI.IPRC2	0.836		
		OI.IPRC3	0.765		
		OI.IPRC4	0.853		
OI: Radical Product innovation		OI.RPDI1	0.878	0.709	0.907
		OI.RPDI2	0.873		

First-Order Constructs	Second Order constructs	Items	Loadings	AVE ^a	CR ^b
OI: Radical Process Innovation		OI.RPDI3	0.763	0.610	0.859
		OI.RPDI4	0.849		
		OI.RPRI1	0.869		
		OI.RPRI2	0.541		
		OI.RPRI3	0.776		
		OI.RPRI4	0.889		
OI ^c		Administrative Innovation	0.779	0.641	0.899
		Incremental Product Innovation	0.812		
		Incremental processes Innovation	0.810		
		Radical Product innovation	0.814		
		Radical Process Innovation	0.789		
		OL.CTL1	0.836		
OL.CTL2	0.850				
OL.CTL3	0.884				
OL.CTL4	0.762				
OL.CTL6	0.752				
OL.OM1	0.838	0.612	0.863		
OL.OM3	0.751				
OL.OM4	0.780				
OL.OM6	0.759				
OL.SHV1	0.792			0.695	0.919
OL.SHV2	0.765				
OL.SHV3	0.868				
OL.SHV4	0.890				
OL.SHV5	0.847				
OL: Shared Vision		Commitment to learning	0.899		
		Open Mindedness	0.819		
		Shared Vision	0.939		

Discriminant validity: Discriminant validity has been assessed using the Fornell and Larcker (1981) method. Discriminant validity is the degree to which items differentiate among constructs or measure distinct concepts (Fornell & Larcker, 1981). The criterion used to assess this is by comparing the AVE with the squared correlations or the square root of the AVE with correlations. The criterion used to assess this is by comparing the AVE with the squared correlations or the square root of the AVE with correlations. Shown in Table 2, the study uses the second method that is to compare the square root of the AVE with the correlations. The criteria is that if the square root of the AVE, shown in the diagonals are greater than the values in the row and columns on that particular construct then we can conclude that the measures discriminant. It can be seen that the values in the diagonals are greater than the values in their respective row and column thus indicating the measures used in this study are distinct. Thus, the results presented in Tables 3 demonstrate adequate discriminant and convergent validity.

Table 3. Discriminant validity

Constructs	1	2	3
1. KM	0.806		
2. OI	0.341	0.801	
3. OL	0.339	0.501	0.887

*Note. Diagonals represent the square root of the AVE while the off-diagonals represent the correlations.

*The criteria is that the correlation for each variables should be less than square root of AVE presented on diagonals.

4.2 Structural Model

To evaluate the structural models’ predictive power, R squares (R^2) were calculated. R squares (R^2) indicates the amount of variance explained by the exogenous variables (Barclay et al., 1995). All two variables together explained 28.4% of the variance in OI. Using a bootstrapping technique with a re-sampling of 3000, the path estimates and t-statistics were calculated for the hypothesized relationships. Figure 5 shows the structural model analysis. From the analysis it was found KM ($\beta = 0.339, p < 0.01$) has a positive significant effect on OL while KM ($\beta = 0.193, p < 0.01$) has a positive significant effect on OI. OL ($\beta = 0.436, p < 0.01$) has a positive significant effect on OI (Table 4). Thus, all the hypotheses are supported. The result of mediation analysis is reported in the next section.

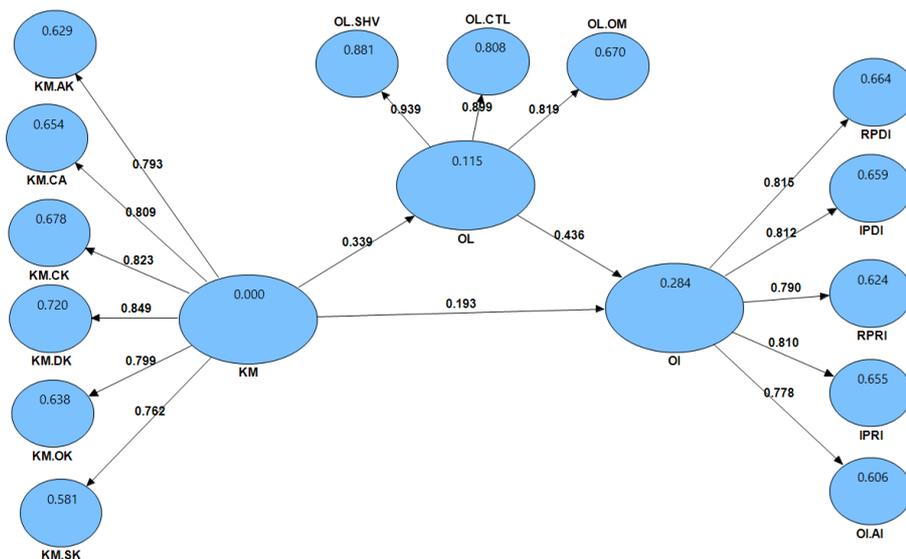


Figure 5. The result of structural model

Table 4. Hypothesis testing-direct relationships

Hypothesis	Relationship	Beta	Std Error	t-Value	Supported
H1	KM→OI	0.193***	0.059	3.230	Yes
H2	KM→OL	0.339***	0.055	6.071	Yes
H3	OL→OI	0.436***	0.051	8.434	Yes
R ² Squares for endogenous variables		OI		OL	
		0.284 or 28.4%		0.114 or 11.5%	

KM=knowledge management; OI=organizational innovation; & OL=organizational learning.

Note: For a 1-tailed hypothesis: * $p < 0.1$ ($t > 1.28$), ** $p < 0.05$ ($t > 1.645$), and *** $p < 0.01$ ($t > 2.33$), while For a 2-tailed hypothesis: * $p < 0.1$ ($t > 1.645$), ** $p < 0.05$ ($t > 1.96$), and *** $p < 0.01$ ($t > 2.58$).

4.3 Mediation Analysis

A In given mediation system as a causal system, one causal antecedent X (KM) is proposed as influencing the outcome variable Y (OI) through one intervening variable M (OL). The total effect of X on Y is partitioned into direct and indirect components. Path from X (KM) to Y (OI) without passing from M (OL) is called direct effect and is symbolized as (c'). The other paths from X (KM) to Y (OI) which pass through are M (OL) is called indirect effects. Indirect effect of X on Y through M only is symbolized as ab. The indirect effect represents how X (KM) through a causal sequence influence Y (OI) where X (KM) influence M (OL), which in turn M (OL) influence Y (OI). The indirect effect passes from antecedent X (KM) to consequent M (OL) and then from antecedent M (OL) to consequent Y (OI) whose coefficient has been symbolized as a*b and calculated as a product of a*b.

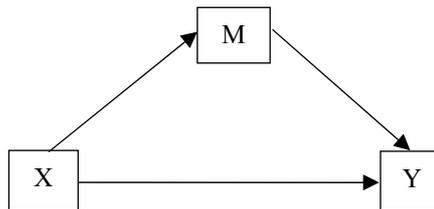


Figure 6. Conceptual diagram-the simple mediation model

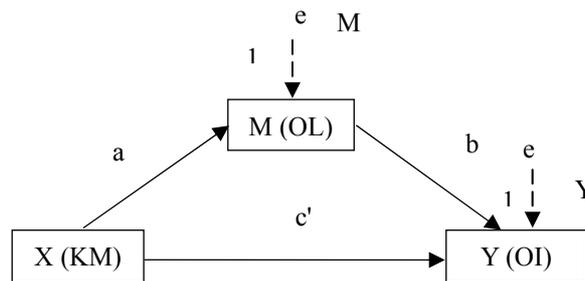


Figure 7. Statistical diagram the simple mediation model-model 4 in process model templates in (Hayes, 2013) Indirect effect of X on Y through M = a*b; Direct effect of X on Y = c'; In this case: X = KM, Y = OI, and M = OL.

Table 5.

N	Abbreviation	Hypothesis statement	Decision
H4	KM→OL→OI	OL mediates the relationship between KM on OI	Supported

4.4 Results of Mediation Analysis for KM→OL→OI

Similar to previous stage, a mediation hypotheses testing was performed by applying an analytical approach described by Preacher and Hayes (2008) and a regression-based approach by Hayes (2013) which is built on Bollen (1989). A bootstrapping procedure (re-sample N=3,000) has been run to assess if product of coefficients, which represents the indirect effect, is significant (Hayes, 2013). The results of bootstrapping procedure are presented in tabular format. Results suggest that each of the separate indirect effects as well as the total indirect effect is significant. The results demonstrates that the direct of KM on OI or c' path is significant (B=0.173, α = 0.004 < p = 0.01). Besides, the total effect of KM → OL → OI or the c path is also significant (B=0.304, α = 0.000 < p = 0.01). In fact, the effects of all other coefficient paths in the model are significant (Table 6).

Besides, as suggested by Hair et al. (2013), the ratio of indirect (I=a*b) to direct effect (c = c' + a*b) can be calculated as I/D. As suggested by Hair et al. (2013), another criterion to reject or accept a mediating hypotheses depends on the size of the ratio of the indirect effect to the total effect (Tables 7). This measure is called Variance accounted for (VAF = ab/(c=c'+a*b)) and determines the size of indirect effect in relation to total effect (Hair et al., 2013). For OL as the mediator, the ratio of indirect to direct effect (0.130/0.173) equals to 75.1% and the proportion of indirect effect to the total effect is (0.130/(0.130+0.173)) is 42.5%. Hence, given the VAF measure, it has been supported that: OL mediates the relationship between KM on OI.

To support the findings, a normal theory test or Sobel (1982) z-test for indirect effects has been carried out using bootstrapping technique to avoid violation of distribution assumption (Tables 7). A bootstrapping technique reduces the risk of facing the indirect effects which are usually positively skewed and kurtosis (Tables 8). The results of normal theory tests or Sobel (1982) z-test is almost identical with the procedure where the mediating effect for OL is evident only at 5%. A normal theory test has also yielded the same coefficients for both KM and OL (Table 9).

Tables 6. Direct and total effect of variables (N=279)

Relationships	Coefficient (Unstandardized)	Std. Error (SE)	t	p	Significant effect/path
IV to Mediators (a path)					
KM→OL	0.380	0.063	5.950	0.000	Exist
Direct Effects of Mediators on DV (b path)					
OL→OI	.348	.0431	7.97	0.000	Exist
Total Effect of IV on DV (c path)					
KM→OI	0.304	0.050	5.998	0.000	Exist
Direct Effect of IV on DV (c' path)					
KM→OI	0.173	0.048	3.568	0.004	Exist
Model Summary for DV Model:					
F (2,276) = 53.884, $\alpha = 0.000 < p = 0.01$					
R-Square: 0.2808					
Adjusted R-Square: 0.2756					

Tables 7. Normal theory tests for indirect effects-mediation analysis (N=279)

Indirect effect	Effect	(SE)	Z	p	Mediation
KM→OL→OI	0.1308	0.0274	4.7817	0.000	Exist

Tables 8. Bootstrapping results for indirect effects (N=279)

Indirect effect	Beta (a*b) Boot	SE	I/D ab/c'	I/D+I ab/c	Bootstrapping Confidence Intervals	95%	Mediating effect exist
KM→OL→OI	0.130	0.028	75.1%	42.5%	0.081	0.195	Yes

Note. The variance accounted for (VAF) determines the size of the indirect effect in relation to the total effect (D+I): VAF > 80% = Large Effect and full Mediation, 80% > VAF > 20% = Partial Mediation, VAF < 20% = almost there is no mediation.

See Hayes, A. F. (2009). *Beyond Baron and Kenny: Statistical mediation analysis in the new millennium*. Communication Monographs, 76, 408-420, Or Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: The Guilford Press.

Tables 9. Decision on mediation hypothesis

N	Abbreviation	Hypothesis statement	Decision
H4	KM→OL→OI	OL mediates the relationship between KM on OI	Supported

5. Discussion

Four hypotheses were proposed/hypothesized to test for the direct effect of antecedents on consequent variables/constructs. In terms of the antecedents of OI (the phenomenon of interest of current study), OL demonstrated the highest coefficients (Beta = 0.436). In other words, in a linear combination of KM and OL to predict the variations in OI, OL contributes the most to the variation in OI with a medium to large effect size. KM is a significant predictor of OL (Beta = 0.193). Therefore, much attention needs to be paid on enhancing knowledge management. In other words, although innovation is determined/depend on learning (OL) in an

organization, an improvement in KM practices can considerably improve innovation (OI) as well as learning (OL). From a practical point of view this means that if a manager is interested to increase the innovation (perception of innovation) in an organization, he/she would better to pay a substantial attention to learning (OL) in given organization. Besides, the effect/impact of KM on variation of organization innovation is substantial. Therefore, a policy that seeks to improve the OI needs to introduce a combination of learning and KM practices.

Further, the partial regression coefficients in the model have different interpretations. For knowledge management, two organization which are equal in OL but differ one unit in their KM practices are estimated to differ by 0.193 units in practicing of innovation in their organization. And eventually, in terms of the positive effect of KM on OL, two organization differ one unit in their KM practices are estimated to differ by 0.338 units in OL in their organization.

Another part of findings of structural model concerns the R squares as the capability of the overall model to predict the phenomenon of interest. The R squares calculated for OI equals to $R^2 = 0.284$ or 28.4% which according to Cohen's table of population effect size and given formula, $f^2 = R^2 / (1 - R^2) = 0.396$, is a large effect. Effect size (ES) is the degree to which H0 is false is indexed by the discrepancy between H0 and H1. In other words, a large ES increase the confidence that the significant finding is not spurious. The large effect size of R squares supported the significant tests and proved that a linear combination of all variables in the model is significantly and sufficiently predicting the phenomenon of interest OI. In other words, the result of measurement model proved that the model is valid and reliable while the results of structural model proved that the model is authentic. However, another 71.6% (100-28.4) of variation in organization innovation has been remained unexplained in this model and therefore, further study is needed to find the other necessary variables.

6. Conclusion

This study inspects the associations between KM, OL and OI. Our results disclose that OL applies a comprehensive mediating impact over KM in the course of OI. In contrast, members of organization with rich KM experience may improve the organizational performance on devotion to learning, open-mindedness and joint vision. On the basis of this piece of writing, it is understandable that KM plays an important part in innovation. It is vital for both KM and innovation experts to comprehend the systematic association among these conceptions along with the importance that it is able to produce in respect of generating and upholding sustainable competitive advantage intended for organizations.

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