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The Impact of Knowledge Process on Innovation in Malaysian Electrical & Electronics Firms

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Abstract: **This paper aims to identify the impact of knowledge process on innovation in Malaysian electrical and electronics firms. This paper employed a quantitative approach, the respondents of this study consist of managers from electrical and electronics firms across Malaysian states. Statistical package for social sciences (SPSS 22.0) was used along with the Partial Least Squares Structural Equation Modeling (PLS SEM3.0) as the statistical instruments. The results obtained have confirmed that knowledge application is significant to innovation. However, acquisition, conversion and protection are not significant to innovation. The study was limited to electrical and electronics firms. Future research could aim to investigate the situation in other manufacturing sectors in Malaysia because innovation is very important to firms and it would lead to new products and services specially, when high technology products are involved.**

Keywords: **Knowledge Process, Innovation, Electrical and electronics Firms.**

1. INTRODUCTION

The concept of innovation has been discussed in prior research due to its importance; process, outcome, or product innovation. It has been shown to affect organizational success (Damanpour & Gopalakrishnan, 1998). The concept has been widely explored in developed countries such as Europe and the United States. The impact of innovation is widely acknowledged for achieving competitiveness and generating organizational success and change. However, since the notion of innovation is a vast area for research, a number of prior studies have investigated this notion from different angles due to its significance in organizational success (Damanpour, 1991). Definitions of innovation vary based on the type of innovation measured. It can either be a product, process or technological innovation. Wilson et al. (1999) mentioned the fact that most initial studies perceive innovation as a uni-dimensional concept. In contrast, Dobni (2008) argued that others considered innovation as a multidimensional concept since measurement of innovation is more appropriate for an organization. However, innovation could be a development of an old idea, a new theory, new product or process that was created by the employees for better future processes. Innovation has different meanings and it depends on the firm's vision and how it deals with innovation (Jiménez-Jiménez & Sanz-Valle, 2007). This paper aims to identify the impact of knowledge process on innovation in Malaysian electrical and electronics firms. Because, research on innovation need to be extended, to understand the methods and antecedents that lead to innovation in organizations. Also, adding to the knowledge in the area of innovation that will help practitioners and policy makers on choosing the suitable type of innovation (Gopalakrishnan and Damanpour, 1997). Despite the fact that Malaysia has achieved a level of success in terms of economic development, however more studies on innovation are needed in Malaysian firms because of the role innovation plays in the achievement of success in individual firms and in nation, alike. Surprisingly, despite previous research on innovation, the fact remains that previous studies and frameworks of innovation have not achieved the required results (Ajagbe and Ismail, 2014).

2. KNOWLEDGE PROCESS

Knowledge processes have been discussed in previous academic literature and studies with regard to tools for effective organizational success. Most of these studies identify the link between knowledge management processes and capabilities with their relationship to organizational performance (Hansen et al., 1999). On the other hand, Gold et al. (2001) described the relationship between knowledge capabilities and performance. Similarly, different knowledge processes models and steps have been addressed in previous literature (Lee & Choi, 2003). For instance DeLong (1997) divided knowledge processes into capture, transfer and use while Gold et al. (2001) identified acquisition, conversion, application and protection. Acquisition process is the initial process of knowledge, when firms start looking for knowledge either from inside or outside the organization (Jimenez-Jimenez and Sanz-Valle, 2012). Huber (1991) defines knowledge acquisition as: "The process by which knowledge is obtained". Organizations start looking for knowledge from outside sources when they lack knowledge; after that knowledge can be brought in from outside or created internally (Leonard-Barton, 1995). Acquiring and sharing knowledge varies among organizations, but all firms select processes and systems to share knowledge between employees (Gloet and Terziovski, 2004). Conversion is the process by which knowledge is filtered and updated for the purpose of being used inside an organization (Gold et al., 2001). There are different types of knowledge conversion processes, which facilitate the flow of knowledge such as: integration (Grant, 1996), combination, coordination (Miller and Friesen, 1984; Moore, 1996; Sanchez and Mahoney, 1996), or distribution of knowledge (Davenport et al., 1996; 1998). To enable the flow of knowledge requires a clear vision to distribute such knowledge effectively, based on scheduled plans and needs (Davenport and Klahr, 1998; O'Dell and Grayson, 1998). Without such planning, knowledge will be scattered, difficult to manage, and of limited value (Gold et al., 2001). It has been argued that knowledge management processes enhance the quality of knowledge and enable the delivery of updated and refined knowledge to different groups (Davenport and Klahr 1998; Grant 1996). The application process refers to the use of knowledge and putting it into practice, formerly little consideration was given to the impact of such processes, but a number of methods relating to such processes have been described in previous studies (Gold et al., 2001). The storage and retrieval of knowledge is important and enhances an organization's response to available knowledge stored. Afterwards, knowledge will be distributed and shared which can lead to enhancement of competencies. Application of knowledge increases a company's competency and enables it to improve its performance (Davenport and Klahr 1998). The protection process is intended to facilitate the use of knowledge internally while shielding it from outside use, and preventing it from scattering outside the organization for security reasons. Such processes are important to achieve organizational success (Porter-Liebskind, 1996). For the company to succeed, its knowledge must be rare and unique (Barney, 1991), but it is difficult to protect such knowledge with any laws or trademarks (Porter-Liebskind, 1996). Therefore, protection processes are important to protect knowledge from outside users (Barney, 1991).

3. HYPOTHESES

3.1 The Relationship between Knowledge Process and Innovation

Different studies have highlighted a close link between knowledge and different organizational outcomes, such as performance or innovative behavior (Hansen et al., 1999). Managing knowledge without a goal will not be effective. Knowledge creation or the development of knowledge brings about innovation to organizations which create new knowledge as most innovation focuses on creating new ideas, products or method. However, the end results depend on the knowledge that facilitates them (Tidd et al., 2001). Such results could be obtained through effective spread of knowledge compared to solely focusing on suitable segments among staff members and different units. With the help of appropriate behavior and knowledge process culture, innovative effects could be met eventually (Garcia-Lorenzo, 2013). Knowledge management is widely considered as one of the determinants for innovation especially knowledge dissemination that can enhance innovation (Grant, 1996). However, earlier studies on the relationship between knowledge dissemination and innovation have identified a number of distinctive outcomes. For instance Darroch and McNaughton (2002) found that knowledge dissemination is not important for innovation in New Zealand firms. On the other hand, Scarbrough (2003) highlighted the role of knowledge sharing in enhancing innovation. Darroch and McNaughton (2002) emphasized the causes for these diverse results include the shortage of studies on the relationship between knowledge and innovation. Also, prior studies have not specified the type of innovation needed since different innovations require different types of knowledge processes. The effect of knowledge will be apparent when it focuses on the development or enhancement of certain organizational activities or processes. The fact is that an increase in knowledge generation and application within an organization will usually lead to a better objective realization, as knowledge processes will manage knowledge for the

benefit of the organization. Knowledge generation requires responsibility in terms of social behavior and collaboration so as to achieve the required results (Newell et al., 2002). Therefore, innovation demands different processes of knowledge sharing and information that can be distributed in areas where innovation is predicted to grow. Although innovation is the result of shared knowledge and behavior in an organization, innovation should not be separated from the process of knowledge (Garcia-Lorenzo, 2013).

4. RESEARCH MODEL

The study targets Malaysia electrical and electronics specifically to generate innovation. This sector is chosen because it produces products and processes that need to be innovative at all times because of the high degree of competition in this sector that necessitates the generation of innovation constantly. Figure 1 presents the research model of the study.

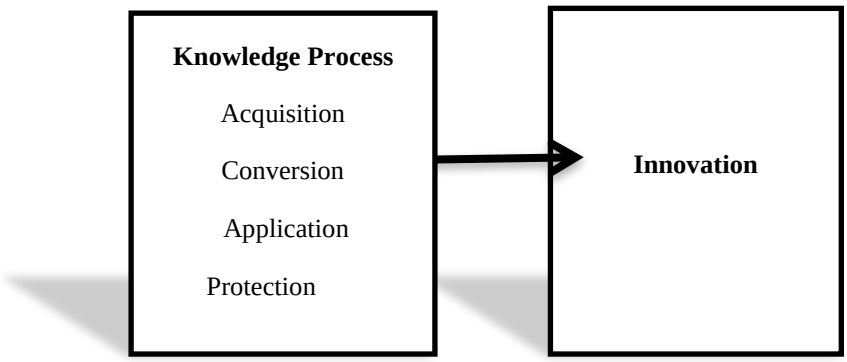

Fig. 1: Research Model

5. METHODOLOGY

The study conducted is quantitative in nature where questionnaires were used as the primary instrument of the study. Zikmund et al, (2010) defined quantitative research as "research that addresses research objectives through empirical assessments that involve numerical measurement and analysis". Neuman (2006) argued that, in a quantitative study, variables and the links between them would be the main concern of the research. As the process moves from a general idea to measurement of these specific variables, numerical data would be drawn. Quantitative research focus on observation eventually distinctive conclusions can be expressed (Zikmund et al., 2010). In this study, variables were measured based on prior studies using a 5-point Likert scale; from 1 (strongly disagree) to 5 (strongly agree). The sample for this study includes local and foreign electronics and electrical firms in Malaysia. Based on the Federation of Malaysian Manufacturers directory (FMM, 2013), there are 287 electrical and electronics firms across Malaysia. The unit of analysis is organization with top managers (general manager, managing director, HR manager, chef executive officer, other manager) as the respondent of the study. Dolma (2010) defined the unit of analysis as "the entity that is being analyzed in a scientific research study". The unit of analysis is an important aspect in any research design. It differs depending on the field of the research: it can be individuals, groups or organizations (Dolma, 2010). Managers are chosen as respondents because of their expertise and well awareness about innovation and the obstacles of innovation in their firms. In this study, 102 replies were received representing a response rate of 35%. The questionnaire consists of three sections. The first section contains demographic information about the survey participants. The second section contains eight items to measure innovation (product, process) that have been adopted from Wang and Ahmed (2004). The third section contains 26 questions to measure knowledge process (acquisition, conversion, application and protection) adopted from (Gold et al., 2001; Smith, 2006).

6. DATA ANALYSIS

In this study, Statistical package for social sciences (SPSS 22.0) was used along with the Partial Least Squares Structural Equation Modeling (PLS SEM3.0) as the statistical instruments. Table 1 shows the mean and standard deviation of each construct. It shows that the two main types of innovation (product and process) possess mean scores of 3.50 and 3.81, respectively. In terms of knowledge process, the mean scores for (acquisition, conversion, application and protection) were 3.89, 3.75, 3.90, and 3.80, respectively.

Table: 1 Descriptive Statistics of Constructs

Construct	Mean	Standard deviation
Product	3.50	.55
Process	3.81	.61
Acquisition	3.89	.59
Conversion	3.75	.56
Application	3.90	.57
Protection	3.80	.61

6.1 Assessment of Measurement Model

PLS SEM is implemented in this research to examine the measurement model and the structural model. Hair et al. (2014) explained that once PLS SEM is applied, a dual step approach must be considered in examining the inner and outer model of the research. SmartPls 3.0 was used to test the proposed hypothesis. The first steps in testing the measurement model include internal consistency reliability, indicator reliability, and the convergent validity. When using PLS SEM, validity is tested by convergent validity and discriminant validity, while reliability is tested by internal consistency reliability. To examine reflective indicators of the measurement model, validity and reliability must be considered (Hair et al. 2014). Internal consistency reliability is the first step in evaluating the reflective measurement model. It is calculated by the cronbach alpha of latent constructs. However, because of the limits of cronbach alpha especially in assuming all items are similarly identical, composite reliability is recommended. When constructs are considered for the assessment of internal consistency, the composite reliability is more reliable than cronbach alpha to assess the reliability of a construct (Hair 2014; Bagoozi and Yi, 1988). Thus, CR of latent constructs represents a satisfactory internal consistency, since CR is greater than 0.7. In the case of convergent validity, item loading should be 0.7 or higher. Chin (1998) suggests the average variance extracted of constructs should be 0.5 or more. Therefore, as Chin (1998) suggests, convergent validity is above 0.5 that is considered adequate. In this study, AVE is considered adequate convergent validity. The second step in assessing the measurement model is examining the discriminant validity. Discriminant validity refers to the distinction of items within constructs. It is achieved by comparing the square root of the average variance extracted and the correlations of constructs (Fornell and Larcker, 1981). As suggested by Fornell and Larcker (1981) assessment of the discriminant validity requires AVE with a score of 0.5 or higher. Table 2 shows the results of measurment model.

Table 2: Results of Measurement Model

Construct	Item	Loadings	CR	AVE
Acquisition	KNAC1	0.813	0.922	0.662
	KNAC2	0.856		
	KNAC3	0.838		
	KNAC4	0.806		
	KNAC5	0.76		
	KNAC6	0.807		
Application	KNAP1	0.806	0.926	0.642
	KNAP2	0.781		
	KNAP3	0.857		
	KNAP4	0.858		
	KNAP5	0.842		
	KNAP6	0.73		
	KNAP7	0.722		
Conversion	KNCO1	0.736	0.888	0.573
	KNCO2	0.793		
	KNCO3	0.826		
	KNCO4	0.779		
	KNCO5	0.793		
	KNCO6	0.589		
Protection	KNPR1	0.809	0.91	0.592
	KNPR2	0.806		
	KNPR3	0.785		
	KNPR4	0.852		

	KNPR5	0.644		
	KNPR6	0.777		
	KNPR7	0.692		
Process	PCIN1	0.713	0.838	0.565
	PCIN2	0.801		
	PCIN3	0.813		
	PCIN4	0.669		
Product	PDIN1	0.861	0.818	0.603
	PDIN2	0.826		
	PDIN3	0.621		

6.2 Assessment of Structural Model

Evaluating the structural model requires assessing the coefficient of determination R^2 and path coefficient, the effect size f^2, and the predictive relevance Q^2. The coefficient of determination represents the sum of variance derived from the exogenous construct to endogenous construct. The higher R^2 is the prediction of the accuracy of the structural model (Hair et al., 2014). In this case, smart PLS bootstrapping was used with a 5000 sample. In this study, only 1 out of 4 hypotheses are supported while 3 showed no significance results. Table 3 shows Knowledge process (acquisition, conversion, application, protection) on innovation. Results show acquisition, conversion, protection are not related to innovation with (β=0.176, SR=0.138,TV=1.279),(β=0.025, SR=0143,TV=0173),β=0.129, SR=0.124,TV=1.041), respectively. Therefore, H1 H2 H4 are rejected. However, application is positively related to innovation with (β=0.312, SR=0.134, TV=2.325). Therefore, H3 is supported. Chin (1998) suggests that R^2 of 0.19, 0.33, and 0.67 is considered " weak, moderate, substantial". In this study, R^2 of acquisition shows 0.46, which is moderate, conversion 0.40 which is moderate, application 0.47 which is moderate and protection 0.42 which is moderate. Based on Cohen (1988) f^2 of 0.02, 0.15,0.35 represents values as weak, moderate and strong. The effect size of acquisition 0.02 which is weak, conversion 0 which is no effect, application 0.06 which is weak and protection 0.01 which is weak as well, the effect size ranges from 0- 0.01. Stone 1974; Geisser (1974) suggested the blindfolding technique to assess the predictive relevance which shows Conversion 0.30, protection 0.30. Table 3 shows the hypothesis testing, explained variance, effect size and the predictive relevance of the study.

Table 3: Hypothesis Testing

Hypothesis		**Std beta**	**Std error**	**T value**	**Result**	**R^2**	**F^2**	**Q^2**
H1	Acquisition -> Innovation	0.176	0.138	1.279	Not supported	0.464	0.02	
H2	Conversion -> Innovation	0.025	0.143	0.173	Not supported	0.401	0	0.307
H3	Application -> Innovation	0.312	0.134	2.325**	**Supported**	0.472	0.068	
H4	Protection -> Innovation	0.129	0.124	1.041	Not supported	0.420	0.015	0.307

Note: significance level: t- value >2.33** (p<0.01); t- value >1.65*(p<0.05)

7. DISCUSSION OF RESULTS

The results show that knowledge acquisition is not related to innovation. This result is consistent with the findings of Lee et al., (2013) in their study of the relationship between knowledge management and technological innovation in Malaysian manufacturing. The authors found that knowledge acquisition is not significant in innovation in terms of product and process. However, some studies have mentioned that a significant relationship exists between knowledge acquisition and innovation. For instance, Darroch and MacNaughton (2002), in their studies on firms in New Zealand, discovered a significant relationship between knowledge acquisition and innovation, but the result in the present study does not support their finding. Therefore, managers in Malaysian manufacturing, especially top managers in electrical and electronics firms, should focus more on the external sources of acquiring knowledge such as research centers or universities that could provide more access to knowledge that can help to accelerate innovation. In addition, they should draw upon the help that could be gained from experts in the field on how to effectively acquire knowledge that can lead to better innovation. Results show that knowledge conversion is not significant innovation in Malaysian electrical and electronics firms. This result is in order with Darroch and MacNaughton (2002) whose study found that knowledge dissemination is not important for innovation in New Zealand firms. Therefore, managers in electrical and electronics should reconsider the methods of knowledge conversion within their firms so that business processes and technical skills

could be enhanced to better target innovative products and services. Converting different types of knowledge to action would enhance different types of innovation in electrical and electronics firms in Malaysia. Senior managers should look into the areas that need special attention in terms of converting knowledge so that innovation can be developed in their organizations. The results show that knowledge application is significant for generating innovation. This finding is in order with Darroch and MacNaughton (2002) who found that acquiring knowledge contributed to the development of types of innovation in New Zealand firms. The finding of the current study reinforces that of Lee et al., (2013) in their study of the relationship between knowledge management and technological innovation in Malaysian manufacturing firms. The researchers found that knowledge application is significant for product and process innovation. Therefore, this study confirms that application of knowledge in electrical and electronics firms would accelerate innovation through the transfer of raw information into usable knowledge that could develop employees' skills and abilities in generating innovative products and services. Appropriate application of knowledge in this industry is vital because of the nature of the industry that needs to constantly produce cutting edge innovative products. Despite the acknowledged importance of protecting knowledge from illegal use by outside organizations and although information is often highly confidential (such as firms data or financial reports), the results of the present study show that knowledge protection is not significant for innovation. Olander (2011) who argued that much knowledge is available to public, but some confidential information should be protected for the safety of organization. As a result, organizations should have in place some procedures to protect their sensitive information from outside to achieve their targeted results. Decision makers in electrical and electronics firms should reconsider their processes for protecting knowledge from illegal use. Further, special departments should be established to monitor the proper use of knowledge within organizations and make sure some of the highly confidential trade deals, for instance, are kept in a safe environment.

8. IMPLICATIONS FOR THEORY AND PRACTICE

This study has aimed to identify the impact of knowledge process on innovation in the Malaysian electrical and electronics firms. Despite prior studies on innovation from different perspectives, the question remains on how to generate it, what are the determinants toward innovation being developed in organizations. Therefore, This study has added the knowledge of understanding innovation, identifying the relationship between knowledge process and innovation. Interestingly, It is noted that this is barely used in the innovation research in the Malaysian electrical and electronics firms. Because this paper is concerned with knowledge process and innovation, it is suggested that based on different views of how knowledge is managed in a firm, a knowledge-based view (KBV) of the firm, is considered central to understanding how knowledge and innovation within organizations can be enhanced. Innovation is very important to firms and it would lead to new products and services specially, when high technology products are involved, such as the production of electrical and electronics components. This paper has reveals knowledge application is the factor that generate innovation to firms. Therefore, Managers need to ensure that knowledge application is well positioned, must be given priority to generate innovation. Also, managers in electrical and electronics firms should focus on innovation especially (product, process) because product innovation is often considered more important and more perceived by customers, on the managerial side, process innovation can be equally important, because it is the means by which the final innovative product is achieved. Some small innovations occur from time to time, such as modifying some business processes or producing new or improved goods, the effect remains weak. For some firms, innovation has taken place only once or twice within the last one or two decades; some other firms are keen to innovate but lack knowledge of the necessary steps to implement it. Therefore, when firms are willing to accelerate innovation, they should first understand what type of innovation is needed.

9. CONCLUSION

Despite influence of innovation on firm success, this paper has revealed that positive relationship and connection between knowledge process and innovation. It has also been shown that knowledge application is the most important determinant of innovation in the electrical and electronics firms in Malaysia. Therefore, Managers in electrical and electronics firms need to ensure that knowledge application is well positioned to generate innovation. Also, they should focus on innovation especially (product, process) because product innovation is often considered more important and more perceived by customers. On the managerial side, process innovation can be equally important, because it is the means by which the final innovative product is achieved. Interestingly, It is noticed that this is barely used in the innovation research in the Malaysian electrical and electronics firms. Hence, this paper gives the innovation research additional understanding of its importance on firm success, it has also offered new vision for innovation in the Malaysian electrical and electronics firms.

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