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Empirical Research on The Relationship Between Organizational learning Capability and Success of Technological Product Innovation Implementation In Electrical and Electronics Sector

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Abstract: The main aim of this paper is to explore the relationship between organizational learning capability and their impact on success of technological product innovation implementation. Research has fairly established that technological innovation is associated with organizational learning. This paper will focuses at implementation phase of innovation process. A total of 115 responses were received from electrical and electronics (E&E) firms in Malaysia. The results of this study showed that there's a significant relationship between participative decision making, experimentation, interaction with external environment and risk taking on success of technological product innovation implementation.

Key words: Technological innovation, organizational learning capability, implementation phase.

INTRODUCTION

There is a general agreement among practitioners such as industry and government, and academicians on how organization should compete in the global market. Organization must be capable of producing reliable product inexpensive, high quality, quickly and easily (Mitala and Pennathurb, 2004). According to Weaver *et al.,* (1998), technological superiority is an important measurement of product success and should be investigated. Therefore, technology plays a significant role through the ability to innovate and also serves as an important source of new product innovation and competitive advantage (Gunasekaran *et al.,* 1998; Porter, 1990). Importantly, developing and exploiting improved functionality of product provide tangible business benefit through integrating new technologies (Karlsson *et al.,* 2010).

Not all innovation implementation efforts lead to success. Normally, when innovations are implemented, many problems emerge and need to be managed by the firm. Although intensive attention from operations, research and development, marketing and business strategy to new product development, there is only a minimal improvement of product success rate (Wind and Mahajan, 1997). New product failure rate estimated at 40 to 90 percent (Stevens and Burnley, 2003; Clancy and Shulman, 1991; Cooper and Kleinschmidt, 1991; Zirger and Maidique, 1990; Ram, 1989; and Ram and Sheth, 1989). Implementing even a relatively small change is frequently a complicated, annoying, and disruptive process that might generate the expected outcomes. Ram (1989) state that higher new product failure encourage firms to understand why customers reject new products rather than accepting them. Nash *et al.,* (2001) also supported that failure is most common than success in the implementation of innovations. However, Iansiti (1995) agreed that recent study in product development stressed on new technology integration stage as the key to success. Instantly, there is a need to study factors that enabling new technology implementation (Davenport, 1993). Amabile *et al.,* (1996) argue that product innovation includes successfully manipulating new knowledge. Therefore, a study should be conduct to identify factor that lead to new technological product success or failure. Then, to be competitive, technological innovation must be used as a main priority by a firm to compete with others in the market.

Literature Review:

Technology innovation implementation provides a good perspective in which to investigate how organizational routines can be changed. Identification of success or failure of innovation can be done through implementation phase of innovation process. A clear innovation phases involved three levels namely; generation, development and implementation (Sundbo, 2000). Implementation phase starts with application and adoption activities commenced for an innovation through previous phases which innovation is generated and developed, and then the implementation phase takes place involving transferring innovation to the operating locations, establishing the innovation into the market and reaching it to possible users (Angle and Van de Ven, 1989). Implementation phase is the least understood phase of the innovation process (Van de Ven, 1993). Klein and Sorra (1996) and Tyre (1991) argue that researchers and managers' values of new technology implementation are crucial in the United State manufacturing firms. Hence, Loveridge and Pitt (1990) state importance of technological innovation in a new product development. When organization decides to use the

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new technology, all preparations must take place to put it into implementation which involves installed and actual usage of related technology.

Companies innovate through a constant learning process which they generate new technological knowledge (Nonaka and Takeuchi, 1995). Learning capability helps firms to identify and respond to market changes faster, cheaper and better even cheaper than competitors (Prieto and Revilla, 2006). Lukas (1996) acknowledged "organizational learning is considered by many scholars as a key to future organizational success". Sinkula *et al.,* (2002) highlighted that the important role of organizational learning capabilities in generating innovation. Importantly, organizational learning can take effect not only at the initial phase of innovation but also at the implementation phase (Glynn, 1996). Study at organizational level has recommended that a process of individuals concentrating to learn new technologies is the answer to implementation success (Aiman-Smith and Green, 2002). In this study, organizational learning is important factor in determining technological product innovation implementation success. Chiva *et al.,* (2007) identify five underlying dimensions of organizational learning capability: experimentation, risk taking, interaction with the external environment, dialogue and participative decision making and the most underlined facilitating factors in the literature. Therefore, this study used organizational learning capability dimensions as suggested by Chiva *et al.,* (2007). The significant relationship between organizational learning capability and technological product innovation needs to be explored further. This objective can be achieved through investigating the dimensions of organizational learning capability and technological product innovation as shown below.

Participative Decision Making and Technological Product Innovation Implementation:

For product innovation processes to succeed, decision making process plays an important role (Kok and Creemers, 2008). Participative decision making increases commitment and involvement and to innovate (Damanpour, 1991). Importantly, when a firm is experiencing a major technological change, the use of participative decision making is the main priority mechanism (Brown, 1979). The increase in participation during decision making will result in less resistance to change and better possibility for adoption of new technology (Wall and Lischeron, 1977). Bahrami and Evans (1987) assert that successful high technology firms practice decentralized decision-making and high degree of participation by line managers in decision-making when dealing with changes in the environment. Furthermore, the ability to participate in decision making is a key process in enhancing innovation (West and Anderson, 1996). Therefore, participative decision making was most essential to technological innovation (Ahmed Fadzil, 2001).

H1. Participative decision making has a positive effect on technological product innovation implementation

Experimentation and Technological Product Innovation Implementation:

Thomke (2001) asserts that experimentation lies at the heart of every company's ability to innovate. Management needs to encourage and support the freedom to conduct experiment with new work methods and innovative process (Senge, 1990; Garvin, 1993; Mcgill, Slocum and Lei 1992). Thomke (1998) argue that to ensure that technological implementation works, it often requires to do experimentation, using trial and error to find solution. Companies that experiment novel technologies are better positioned to have a higher rate of innovation than firms that invest all their efforts in exploiting the existing, familiar technologies (Beerkens, 2004). Precipe (2000) mentions that to understand technological failure and to gain knowledge resulted from failure will be helpful for subsequent technology or product development. New technologies reduce the cost and time of experimentation, allowing companies to be more innovative (Thomke, 2001). Through experimenting new technology, organization can accelerate its innovation in effective way especially in new technology.

H2. Experimentation has a positive effect on technological product innovation implementation

Interaction With External Environment on Technological Product Innovation Implementation:

Dependent on other sources of experience is important for firm with new product to successfully explore new way to compete (March, 1991). Cyert and March (1963) argue that an organization needs to deal with external shocks, in turn they must adapt and learn to cope with that situation in their whole life. External environment demands organization to be more cautious. The current trend in innovative firm which previously depended on internal R and D, is highly working with external sources for the purpose of generating new product concept and building technology for product development (Chesbrough 2003). Varis and Littunen (2010) showed that external sources of information are positively associated with the introduction of novel product innovations in firms. Organization need to establish relationship with external entities including customer, competitor or government agency etc. Such collaboration will bring benefit to the firm including the latest changes or developments which affect firm competitiveness.

H3. Interaction with external environment has a positive effect on technological product innovation implementation

Risk Taking and Technological Product Innovation Implementation:

Liles (1981) defines risk as the probability of an unconstructive result occurring from various courses of actions. Risk-Taking is the organization' s enthusiasm to break away from normal path and venture into unknown territory (Venkatraman, 1989; Wiklund and Shepherd, 2003). Kouzes and Posner (1987) argue that learning from successes and mistakes resulted from risk taking will lead to increasing business opportunities. Employees need support and collaboration among themselves to reduce fear and gain openness which encourages new risk taking (Hurley and Hult, 1998). Peter and Waterman (1982) suggest that companies that are able to manage risk taking properly in their industrial context will achieve excellence result. Saleh and Wang (1993) showed that innovative companies are more engaged in risk taking compare to less innovative companies. The willingness to take risk or risk taking will open great opportunity to firm in implementing technological innovation.

H4. Risk taking has a positive effect on technological product innovation implementation

Dialogue and Technological Product Innovation Implementation:

Isaacs (1993) and Schein (1993) state that most scholars and practitioners of organizational learning see the process of dialogue as to provide an avenue for communication and collaborative learning within and between groups and teams. In organisational studies, dialogue has become important as an aspect of understanding the difficulties and possibilities of learning and change (Gear *et al.,* 2003).

Importantly, successful technological innovation is positively influenced by individuals communication (Balthasar *et al.,* 2000). The process of inter-functional coordination promotes communication, collaboration, cohesiveness, trust and commitment among different functional areas (Auh and Menguc, 2005) and the extent of product innovation (Zhang and Yanling, 2010). Frederick (2005) stresses that development of new product is a complex process requiring cross-functional involvement from beginning and throughout the process. Integration level is a critical determinant of new product performance (Song and Parry, 1992). The role of dialogue among organizational members can produce better understanding by sharing meaning on related issues. Organizational members also can reach mutual understanding and alleviate the speeding in sharing information.

H5. Dialogue has a positive effect on technological product innovation implementation

Theoretical Framework:

Theoretical foundation of this framework is mainly derived from resource-base view (RBV). Newbert (2007) argues that a current review of empirical RBV literature in management relate firm' s competitive position depends essentially on its organizing context and on its valuable, rare and inimitable capabilities and core competencies rather than on its static resources. However, resources are inadequate for gaining a sustained competitive advantage and a high performance, as well (Teece, 2007; Newbert, 2007). Being so, firms must be capable to change resources in capabilities and accordingly in a positive performance (Ferreira and Azevedo, 2008). Combination between RBV and Capability theory provide a clear direction in this framework as transform resources into capability will create a unique resources that hardly to imitate by others firms. Innovation must go through into several processes of what we called as "innovation process". A clear innovation phases involved three levels namely; generation, development and implementation (Sundbo, 2000). An ultimate innovation impact can be measured through a last innovation process; the implementation phase. Therefore, this study will investigate at implementation phase of innovation process. Figure 1 present a research framework concerning the relationship between constructs of the model.

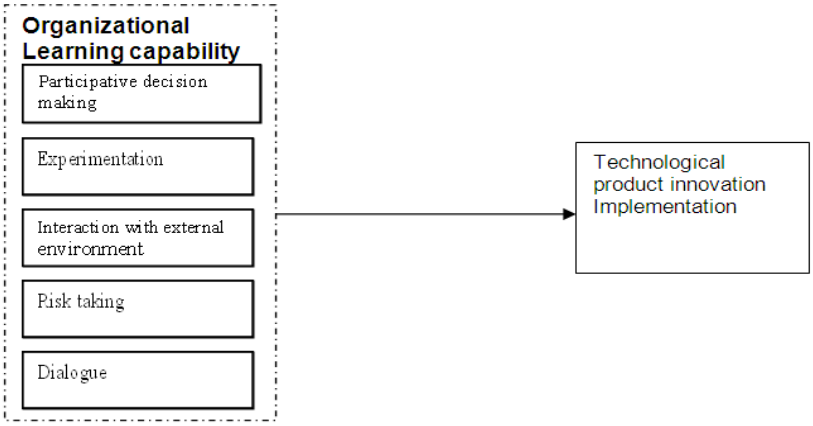

Fig. 1: A Research Framework.

Methodology:

Data Collection:

Empirical study is used in this research. It involves a correlational field study for the purpose of testing the relationship between the independent, moderating and dependent variables. Cross-sectional study was used where data were collected at one point in time. For this study, self-administered questionnaire was employed as the survey method. Two main concepts form the construct variables; organizational learning capability and technological innovation implementation. The organizational learning capability dimensions used five point scales for its measurement. These measures were adopted from various past researches. This study used a five-point Likert scale rating from 1= Strongly Disagree, 2= Somewhat Disagree, 3= Average, 4= Somewhat Agree, 5= Strongly Agree. It comprised five dimensions on participative decision making, experimentation, interaction with external environment, risk taking and dialogue was taken from Chiva *et al.,* (2007). Items for successful technological product innovation implementation were adopted from Noori and Munro (1998), Raymomd (2004) and Cozijnsen *et al.,* (2000). A question" to what degree is the technological product innovation successful" was used to gauge the success of technological product innovation implementation. A measurement for successful technological product innovation implementation ranged from 1= Significantly below Targets, 2= Below Targets, 3= Met Targets, 4= Exceeded Targets and 5= Significantly Exceeding Targets.

Sample of Study:

The population for this study consists of the electrical and electronics (E&E) firms in Malaysia that has involved in new manufacturing project within the past five years (2005-2009), which was the length of time suggested by Burgess *et al.,* (1997) and Frohlich (1999). This is consistent with the study conducted by Munro and Noori (1988) which used the same period as consideration of new technology in a developing country. The list of the firm was obtained from Malaysia Industrial Development Authority (MIDA), a government body. The total number of innovative firms is 475. In deciding the suitable sample size for this study, Krajce and Morgan (1970) suggested that 214 is suitable for a population of 475 (cited in Sekaran, 2003). Hussey and Hussey (1997) assured that the response rate for postal distribution was usually 10% or lower. Given the small sampling frame of the study and the likelihood of low response rate from a mail survey (Sekaran, 2003) in Malaysia such as Lily Julienti and Hartini (2010), 20 percent; Azmawani (2008), 8 percent; Chan, Suhaiza and Fernando (2009); 20 percent. Therefore, a total of 475 firms were included and census method is employed in this study. A total of 115 completed questionnaires were received. The response rate is 24.2%.

Data Analysis and Result:

Data analysis was carried out using Statistical Package for the Social Sciences (SPSS) packages. The characteristics of the responding firms are presented in Table 1. Out of the 115 responses, 59.8% were foreign companies and 5.2% involved in joint venture. The remaining 34.8% were local companies.

Table 1: *Profile of sample firms.*

Variable	Categories		Frequency	%
Ownership Status	Malaysian fully owned	Joint venture	40	34.8
	American-based	Japanese-based	6	5.2
	European-based	Others	20	17.4
			14	12.2
			10	8.7
			25	21.7
Age of the firm	Less Than 6 Years		18	15.7
	6- 10 Years		38	33
	11-15 Years		37	32.2
	More Than 15 years		22	19.1
No of Employee	Less than 100		31	27
	100-250		30	26.1
	251-500		21	18.3
	501-1000		23	20
	More than 1000		9	7.8
Type of Product	Consumer products	Industrial Products	41	35.9
			73	64.1

In terms of duration of operation, 33% of the firms have been operating for 6-10 years, 32.2% of the firms have been in operation for 11-15 years, 19.1% of the firms have existed for more than 15 years and 15.7% of the firms have been in the industry for less than 5 years. 27% of the firms provide work for less than 100 employees, 26.1% of the firms have between 100-250 employees, 20% of the firms retain between 501-1000 employees, 18.3% employed between 251-500 employees and only 7.8% of the firms use the services of

more than 1000 employees. Regarding types of product, the results show that 64.1% of the firms produce industrial products and the remaining 35.9% produce consumer products.

Reliability Analysis:

The internal consistency of the newly found factors was examined by computing the values of Cronbach Alpha. The Cronbach's alpha to measure the constructs for consistency and homogeneity was used to assess if the subsets of items 'hang together as a set and the minimum acceptable reliability level be set at 0.60. (Sekaran, 2000). As shown in Table 2, depicted a reliability result.

Table 2: Reliability Analysis.

Variable	Cronbach's alpha
Participative decision making	.93
Experimentation	.92
Interaction with external environment	.80
Risk taking	.88
Dialogue	.93
Technological Product Innovation implementation	.92

Hypotheses Testing:

Table 3 presents results of regression analysis used to assess the strength of the proposed relationship. Hypotheses were formulated and all the variables retain after filtering with factor analysis. The results of the regression analysis are discussed below: Hypothesis H1, H3 and H4 were accepted which showed a positive relationship on success of technological product innovation implementation. Table 3 revealed that participative decision making is the most significant predictor (β= .334, ρ=.01) followed by risk taking (β= .274, ρ=.01) and interaction with external environment (β= .228, ρ=.10) of success of technological product innovation implementation. Unfortunately, for hypothesis H2, the finding show that experimentation (β= -.373, ρ=.01) produce negative effect on success of technological product innovation implementation. For hypothesis H5, dialogue shows insignificant relationship with success of technological product innovation implementation.

Table 3: Regression Result – organizational learning capability and technological product innovation implementation.

Model	Standardized Beta Coefficient	t	Sig.
Participative decision making	.334	3.137	.002
Experimentation	-.373	-3.189	.002
Interaction with external environment	.228	1.941	.055
Risk taking	.274	2.785	.006
Dialogue	.024	.213	.832
F value	7.131		.000
R^2	.257		
Adjusted R^2	.221		
ndent variable technological product innovation implementation			

RESULTS AND DISCUSSION

From theoretical perspective, the model can shed light on the importance of organizational learning in success of technological innovation implementation. Our finding on direct relationship organizational learning capability factors and technological product innovation implementation revealed that participative decision making, interaction with external environment and risk taking is consistent with prior studies. Previous studies found that participative decision making has a strong relationship with technological innovation (Ahmed Fadzil, 2001; Brown, 1979; Bahrami and Evans, 1987; Davis *et al.,* 1989; West and Anderson, 1996). Through participation, the accessibility to organization information increases and this creates self ownership of decision making among employees. Participative decision making can improve quality and ownership of decision. Scott-Ladd and Chan (2004) suggested that participative decision making plays a role in gaining better access to information and improves the quality and ownership of decision outcomes. A recent studies also confirmed that interaction with external environment is positive relationship with technological innovation (such as Stock and Tatikonda, 2008; Huizenga, 2000 and Saad *et al.,* 2002). An explanation is that the positive relationship between the interaction with the external environment and the success of technological product innovation implementation is because of the benefit of the interaction. A firm could benefit from external partners through reduction in cost, creation of new opportunities, faster and better results, more simplicity in defining priorities and motivation for internal innovation (Mason, Beltramo and Paul, 2004). A positive relationship between risk taking and technological innovation in line with previous studies (such as Jassawalla and Sashittal, 2002; Wan *et al.,* 2000; Tushman and O'Reilly, 1997 and Schivardi and Schneider, 2008). The positive effect of risk taking on the success could also due to firm risk taking orientation for higher return. March (1991) stated that high risk is

associated with novelty, also contributes to higher return. Contrary to expectation, experimentation has negative effect on the success of technological product innovation implementations. This study provides evidence that lower level involvement of experimentation leads to the success of technological innovation implementation. Through experimentation, technological breakthrough will not inevitably promises new product success (Flint, 2002). A plausible reason why experimentation has a negative effect on the success is the inexperience of technology users. Stock and Tatikonda (2000) found that technology users cannot immediately utilize new technology adoption because of inadequate experience or expertise even the technology is less complex. A new technology users need to understand and practice to see how it works. To master a new technology may take a long time or need assistance from third party such as technology provider. A studies conducted by Jamali and Sidani (2008) and Bhatnagar (2006) revealed that opportunities for experimentation receives little attention. The findings from this research showed that there is non-significant relationship between dialogue and success of technological product innovation implementation. This opposed with previous studies conducted by Aksu and Ozdemir (2005) Ayers *et al.,* (1997), Song and Parry (1992) and Sethi (2000) claimed that dialogue has a significant relationship with technological innovation. This could also be due to lack of management support or democracy on team. Managers do not support the free display of emotions and this will inhibit the emergence of new ideas when organization mostly needs a creativity and contextual knowledge (Duck, 1993). From the study, it can be concluded that success of technological innovation implementation be enhanced by participative decision making, interaction with external environment and risk taking. However firm should less involved in experimentation to ensure success of technological product innovation implementation.

Limitation and Future Research:

This study focuses on electrical and electronics firms in Malaysia; therefore, its findings cannot be generalized to other sectors or subsectors. Every sector has its own characteristics and expanding this study to other country and sectors is necessary. Moreover, issues of applicability of this study to other countries need to be considered. Importantly, the results of this study should be treated with caution when applied to other sectors or subsectors or other countries. Measures of organizational learning capability and the innovation implementation outcomes are based on perceptual scales. Perceptual measures may not give accurate results, compared with objectives measures, due to respondent bias. However, in this study perceptual measures were used because the objective measures are difficult to obtain. The sample of respondents was small in order to consider the results of the research applicable to the overall population of Malaysian manufacturing sector.

Conclusion:

The results from the study revealed that participative decision making, experimentation and interaction with external environment have been found to influence success of technological product innovation implementation. Dialogue did not give significant effect. This information is important when designing implementation of new technology and change management strategies as interventions need to be designed specially to meet the company' s competitiveness.

Effective organizational learning capability helps in improving innovation implementation of business organizations in the society as well as generating significant outcomes to the organization. In this respect, organizational learning capability is suggested as an effective way to extend the success of technological product innovation implementation in the organization.

The overall findings indicate that technological product innovation implementation is a promising area of research and practice that need advance research to explain on how and why valuable technological innovation could/should be implemented in the organization. As the whole, this research has contributed to the existing bodies of knowledge, theory building and practical perspectives on the technological innovation implementation.

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