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The Significant Role of Entrepreneurial Orientation in Fostering Technological Innovation Capabilities among Small and Medium-Sized Manufacturing Enterprises

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Abstract: Technological innovation capabilities have become an important component for small and medium enterprises (SMEs) in the manufacturing industrial sector to cope with intense competition and to fulfill the increasing customers' requirements and needs. In the midst of such environment, successful manufacturing firms are those who are able to satisfy customers' needs optimally and not those whose determination is confined to the market's needs. To achieve such a feat, technological innovation is considered as a suitable mean. Hence, the general consensus is that 'innovation is power' for the firms to gain competitive advantage. However, small and medium-sized enterprises (SMEs) in manufacturing sector in particular face tremendous challenges in their attempt to pursue technological innovations. The purpose of this study is to shed further light on the factor influencing technological innovation capabilities among small and medium-sized enterprises manufacturing firms. This study involves a survey among small and medium sized manufacturing firms in Malaysia. In order to effectively generalize the research findings, 112 questionnaires were gathered from the selected respondents. The results show that technological innovation capabilities are positively influenced by entrepreneurial orientation of the firms. The result indicates that strategic orientation that is risk-taking, proactiveness and innovativeness urges the firms to consider new ideas and take part in creative venture, tolerate risks and proactive. In making decisions that are related to technological innovation, enterprises are likely to consider whether or not they receive entrepreneurial opportunities. The outcome of this study is expected to stimulate future conceptual and empirical research on this important topic and has implications for SME manufacturing managers and policymakers.

Keywords: Technological innovation capabilities, Entrepreneurial orientation, Small and medium sized industry, Manufacturing.

I. INTRODUCTION

It is well known that the manufacturing industry develops faster than other economic sectors, due to the distinctive capability of industries to embrace technological and manufacturing innovations and modern management methods, in addition to their orientation towards production specialization in various fields. Hence, manufacturing enterprises play a vital role because they overlap with other sectors and have great opportunities to contribute to a larger portion of the gross domestic product (GDP) (Bakar & Ahmad, 2010; Pullen, de Weerd-Nederhof, Groen, & Fisscher, 2012). The manufacturing sector, especially Small and Medium-sized Enterprises (SMEs), plays a focal role to achieve noticeable economic leaps and high income levels, which can be sustained for the long-term through production and exportation activities (González-Loureiro & Pita-Castelo, 2013; Westerberg & Frishammar, 2012). Additionally, SMEs manufacturing enterprises serve as an efficient way to bring about the new technologies that contribute to developing and integrating all other economic sectors (Guo & Shi, 2012).

Nevertheless, the industry has been experiencing a number of issues recently, such as sustainability (Choi & Lim, 2017). To find solutions for this issue, an increasing number of studies have been conducted to investigate the role of innovation processes in fostering manufacturing firms' sustainable development (Bos-Brouwers, 2010; Gaur, Vasudevan, and Gaur, (2011). This is probably due to the fact that sustainability has long been acknowledged as one of the innovative and potentially transformational forces that creates new products and processes that challenge existing practices (Choi & Lim, 2017, Bloch & Bhattacharya, 2016). In addition, it is widely accepted that the major sources of competitive advantage formed by technological innovation capabilities (Freeman, 1997). To become imperative tool, the manufacturer should have ability to introduce new products and adopt new process in shorter lead time (Sen & Egelhoff, 2000). The significance of innovation for SMEs became evident with the heightening pressure experienced in the period of the 1980s and 1990s by firms owing to the entry of new competitors from international markets, and it is based on firms that focused on the manufacture of specific products that are geographically clustered in European countries (Parrilli & Elola, 2011). Thus, technological innovation (product/process) became the main key to survival and enhancement in various innovative activities of SMEs (Guo & Shi, 2012).

However, most previous studies on both sustainable development and innovation mainly studied the context of large firms (Choi & Lim, 2017; Pullent *et al.*, 2012). The manufacturing sector, especially Small and Medium Enterprises (SMEs), plays a focal role to achieve noticeable economic leaps and high income levels, which can be sustained for the long-term through production and exportation activities (González-Loureiro & Pita-Castelo, 2013; Westerberg & Frishammar, 2012) and yet less focuses is given on the sustainability issue and innovativeness of this sector. In Malaysia, small and medium enterprises (SMEs) have a significant presence in the Malaysian manufacturing sector. Around 90 percent of the total firms in the manufacturing sector are categorized as SMEs, where these firms account for almost 29 percent and 33 percent of the total output and employment in the manufacturing sector, respectively (Lee & Lee, 2007).

Undeniably, innovation is recognized as one of the key factor in sustaining Malaysia's competitiveness to face with the rapid globalization and the government aims to transform Malaysian economy into innovation-led growth. However, studies concerning innovation in Malaysia are limited. While there have been few studies on innovation in Malaysia (Rasiah, 2009; Narayanan & Wah, 2000, Lee & Lee, 2007)) less attention has been paid to analyzing the issue of entrepreneurial orientation as a determinant factor to

fostering technological innovation in Malaysia, hence providing little evidence for any significant policy directions.

In light of the above discussion, this research believes that one of the issues leading to the lack of innovation capabilities in manufacturing SMEs is lack of proactive and risk-taking attitude and innovativeness within these enterprises, which are associated with entrepreneurial orientation (EO). Related studies have pointed out three incorporated dimensions of EO, namely: risk taking, pro-activeness and innovativeness (Baker & Sinkula, 2009; Jones & Rowley, 2011; Miller, 1983; Wales *et al.*, 2013). The majority of these studies have been conducted in large-sized firms within mature and stable economies and developed countries. Therefore it is important to extend the study on the effect of EO on technological innovation capabilities within SMEs in a developing economy, like Malaysia.

II. LITERATURE REVIEW

Technological Innovation Capabilities

The term 'innovation' is taken from the Latin word, 'novus' or 'new', and is defined as a new idea, method or device or the process of presenting something new. According to Kamasak and Bulutlar (2010), innovation is best understood as generation, adoption and implementation of new ideas, policies, programs, processes and products/services to the organization adopting it. Meanwhile, Crossan and Apaydin (2010) developed a comprehensive definition of innovation; they defined it as the generation or adoption, assimilation and use of a value-added new invention in the economic and social field that realizes the renewal and enlargement of products and development of novel production techniques; and the establishment of new systems of management. It is process as well as outcomes. Various innovation types are highlighted in literature. The most widely accepted classification is the one brought forth by Damanpour (1991), wherein he differentiates between technological and administrative innovation. Technological innovation refers to new processes, products and services; while administrative innovation refers to novel procedures and policies, covered under the umbrella of non-technological innovation (Jiménez-Jiménez & Valle, 2011; Ngo & O'Cass, 2013).

With regards to technological innovation capabilities (TIC), the increasing pressure from global competitiveness, decreased product life cycle and ease of imitation, make it necessary for the firms to continue their innovation in order to remain competitive. In other words, innovation has become the platform for productivity enhancement, growth of sales volume and firm competitiveness. Such pressures are also urging firms to create and innovate to improve their product competitiveness in terms of design, quality and service reliability. As such, firms have to upgrade their innovation capability to develop and commercialize new technologies effectively and bring about the development of technological innovations throughout the organization to reinforce their competitive advantage (Börjesson, Elmquist, & Hooge, 2014; Wang, Lu, & Chen, 2008).

In a similar vein, Börjesson *et al.*, (2014) referred to innovation capabilities along the following dimensions: resources that cover human resources, equipment, technologies, product designs, information, cash and relationships with external stakeholders; processes that cover all required methods and activities to change inputs into valuable outputs and cover the patterns of the firm's cooperation, coordination and decision-making; and lastly, values that encompass criteria of decision-making and the decision makers'

mindset. From the above, it is evident that the innovation capabilities concept is often defined in general contexts.

As it is obvious, all these dimensions revolve around technological innovation capabilities (TIC) of an enterprise. Thus, TIC is considered as one of the most critical factors to the enterprise in achieving competitiveness due to the fact that such capabilities might award extra valuable, scarce, differentiated and inimitable products and process simultaneously to a higher level of competition (Dhewanto *et al.*, 2012).

A firm's ability to launch new products and adopt new processes in a shorter time has become very important (Guan, Yam, Mok, & Ma, 2006); this requires the ability to efficiently launch new products and to employ new processes (Camisón & Villar-López, 2012; Lawson & Samson, 2001; Tepic, Fortuin, Kemp, & Omta, 2014). Further, innovation capabilities are described as the power of the firm to implement new or enhanced goods, services or processes, or even new marketing approaches, or new business practices and external connections (Basterretxea & Martinez, 2012; OECD, 2005; Tuominen & Hyvönen, 2004). This study follows Damanpour's (1991) definition to discuss and explain the dimensions of technological innovation capabilities (TIC) and define it as a special kind of resources that needed to effectively enhance existing product, manufacturing process and to create new ones, which are the foci of this study, as explained in the following sections.

Entrepreneurial Orientation

The idea of an entrepreneurial orientation (EO) to portray the mindset of firms involved in pursuing new ventures gives a useful framework for researching entrepreneurial attribute and activity (Lumpkin & Dess, 2001). These attributes and activities are captured in a definition by Miller (1983), who defined entrepreneurial firm is the one that “engages in product market innovation, undertakes somewhat risky ventures and is first to come up with ‘proactive’ innovations, beating competitors to the punch”. Huang and Wang (2011) in their research on identifying innovation levels in SMEs considered innovation as entrepreneurial orientation (EO) outcome. Entrepreneurial orientation is defined as the firms' strategic orientation that captures certain boundary of entrepreneurship of decision-making model, working manners and their managerial activities. There were many empirical evidences proved that EO has contributed significant influence on the firm's competency to adapt to changes in the business environment via the provision of diverse types of innovations (Hong, Song & Yoo, 2013; Li *et al.*, 2008). As been mentioned by scholars such as Baker and Sinkula (2009), Jones and Rowley (2011), Boso *et al.* (2012), and Wales *et al.*, (2013), firm that possesses an EO is characterized as risk-taking, pro-activeness and innovativeness to be able to recognized the requirements of both market and customers and fulfil these needs through new innovations. In a similar vein, Atuahene-gima and Ko (2001) provide an accurate picture for the relationship that relates EO with innovation.

Basically, they argued that the key reason inferred in this relationship is represented in one of the EO dimensions which is a high level of innovativeness. This is also supported by Henard and Szymanski (2001), and Baker and Sinkula (2007) who discovered that product innovation is very much associated with innovativeness. Furthermore, Chen (2012) and Cheng *et al.* (2012) emphasized the significant role of other dimensions of EO such as risk-taking can foster firm's capability to generate new products and process. The nature of firm's risk-taking characteristic encourages it toward devoting the necessary resources which assist in generating new innovations (Ko & Lu, 2010; Zhou & Tse, 2005). Previous study by Zellweger *et al.* (2011) has also confirmed a positive influence of another dimension of EO namely pro-activeness on

innovation and value creation. Hence, EO plays an antecedent role for technological innovation capabilities (Bakar & Ahmad, 2010; Weerawardena & Coote, 2001), this leading to the following hypothesis:

H1: The higher the entrepreneurial orientation (EO) of the firm, the higher the technological innovation capabilities (TIC) the firm will acquire.

Based on the literature discussed earlier, we develop a framework for this study which is shown in Figure 1 below.



Figure 1: Proposed Conceptual Framework

III. METHODOLOGY

Research Design

As is normal in research fields, researchers deal with aggregate form of elements, which can be a person, a group, an organization, an event or even a social action. All elements of interest to the researcher represent the population of the study (Marczyk *et al.*, 2005; Nueman, 2007; Sekaran & Bougie, 2009). Typically, researchers investigate a subgroup of the population, and that subgroup is called a sample (discussed later) due to the difficulties that they may face in investigating the whole population of interest. Therefore, it is essential that the sample be representative of its population and that could be done by answering a critical question, namely, who is to be sampled? This could be answered through an accurate determination of the target population (Cochran, 1977; Marczyk *et al.*, 2005; Zikmund *et al.*, 2010). A target population must be accurately defined in order to include the right elements within the sample frame from which the final subjects will be chosen (Babbie, 2011).

The population of this study comprises of SMEs manufacturing enterprises in Malaysia. These enterprises are different in terms of production and cover a wide variety of industrial activities namely machinery and equipment, construction materials, food industry, electric industry, non-metal industry, metal industry, textiles industry and paper industry. In this study, 310 questionnaires were distributed using mail and internet survey to manufacturing SMEs operating in Northern Region in Malaysia, of which 128 questionnaires were returned. From this number 16 were incomplete and were rejected from subsequent analysis. With 112 completed questionnaires, it gives the response rate of 36 percent.

There are 16 items to measure TIC, which investigate both product and process dimensions of the TIC construct namely, product innovation capabilities, which refer to any novel product to satisfy customers' needs; and process innovation capabilities which involve firm's wide efforts to create or improve a manufacturing method and bring about new developments in the process or system. The measurement scale is adopted from Camisón & Villar-López (2012), Menguc and Auh (2010) and Tuominen and Hyvönen (2004). Camisón & Villar-López (2012) used the instrument and found the composite reliability to be above 0.81 for this instrument. On the other hand, there are 20 items used to measure the three dimensions of entrepreneurial orientation (EO) namely (i) proactiveness which refers to the level of firm's anticipation and response to the future needs of market and customers; (ii) risk-taking which refers to the extent to

which firm owners/managers are interested in employing a big proportion of firm resources and to afford huge debts in their seeking behind the opportunity; and (iii) the innovativeness that refers to firm’s capability and tendency to participate in and encourage new ideas which may lead to producing new products or applying new processes. This measurement is adapted from Miller and Friesen (1982). Boso *et al.*, (2012) found that composite reliability ranged from 0.92 to 0.71; Avlonitis & Salavou (2007) found that the Cronbach’s Alpha was 0.78 which indicates that the measure is reliable. All questions are accompanied by a five point response, ranging from ‘5’ for “Strongly agree” to ‘1’ for “Strongly disagree”.

IV. ANALYSIS

Regarding the demographic information of the respondents, it was found that majority of the firms (60%) involved in the machinery and equipment. With regards to the duration the firms have been operating in the industry, the majority of the firms (56%) have been operating for 10-20 years, these results show that the sample in the present study constitutes manufacturing firms that possess considerable experience to enable them to make new innovations. The size of the firms was determined through the number of employees they employed. For this purpose, the firms were divided into three groups. The majority of the firms (63%) have between 20-99 employees; followed by 28 percent with employees between 10 to 19 employees and the remaining nine percent have less than or equal to nine employees. Also, the results show that majority of the SMEs firms are owned by local owners.

To test hypothesis (H1) which is regarding the influence of entrepreneurial orientation (EO) on technological innovation capabilities (TIC), regression analysis was tested. However, before performing the actual hypothesis test, correlation between TIC and EO constructs was derived. As depicted in Table 1 below, there is a positive correlation between EO and TIC ($r = .54$; $r < .01$). The individual hypothesis was then tested using a regression prediction model (Hair *et al.*, 1998) with TIC is treated as the dependent variable and EO as the independent variable. As shown in Table 2, EO is positively related to TIC ($\hat{\alpha} = .41$; $p < .01$). Therefore, the hypothesis was supported. The R^2 obtained for TIC means that 35 percent of the variance in the dependent variable (TIC) was explained by the variation in the independent variable, EO.

Table 1
Pearson Correlation

	EO	TIC
EO	1.0	
TIC	.54(**)	1.0

** Correlation is significant at 0.01 level (2 tailed)

Table 2
Regression Analysis

Independent variables	Coefficient (β)	B	SEB
<i>Dependent variable: TIC</i>			
EO	.41**	.51	.04

Note: $R^2 = .35$; $F = .00$; Sig. $F = .96$; B= Unstandardized coefficient beta; SEB= Standard error of regression coefficient; β = Beta coefficient

V. DISCUSSION AND CONCLUSION

The effect of EO on TIC within manufacturing SMEs is largely lacking in literature, although there are few studies that have attempted to examine this relationship (Avlonitis & Salavou, 2007; Huang & Wang, 2011; Pérez-Luño *et al.*, 2011). Therefore, the present study contributes to literature by examining these relationships in the context of manufacturing SMEs in Malaysia.

The result reveals that the entrepreneurial orientation (EO) is positively associated to technological innovation capabilities (TIC) of the SMEs manufacturing firms. The positive relationship between entrepreneurial orientation and technological innovation capabilities found in this study is in line with previous studies in the similar area, such as Boso *et al.*, (2012); Huang and Wang, (2011); Jones and Rowley, (2011); Pérez-Luño *et al.*, (2011); Zahra, (2008) and Zortea-Johnston *et al.* (2011). The finding indicates the important role of entrepreneurial orientation in responding to the opportunities of new products and process innovations, which develop when some entrepreneurs have shrewdness into the value of particular resources that others do not. The positive relationship indicates that in decision making process that are linked to technological innovation, SMEs manufacturing firms are expected to consider whether or not they obtain entrepreneurial opportunities. This shows that the characteristics of entrepreneurial orientation and its dimensions motivate the firms to consider new ideas and encourage creativity, gives consideration on activity involves risks and pre-emptive activities. With regards to the Malaysian SMEs manufacturing firms, it can be concluded that entrepreneurial orientation (EO) of the firms is a solid means for achieving technological innovation capabilities (TIC) and this perhaps is more pertinent to be applied during the economic turmoil which hits Malaysian presently.

From the managerial perspective, the obtained results provide relevant implications for practitioners and policy-makers. The present study presents beneficial and enlightening insights on the significant role of entrepreneurial orientation to help boost the technological innovation capabilities of manufacturing SMEs. The study's findings explain that technological innovation is one of the major survival characteristics of a company that is seeking to achieve a strategic position in the marketplace. Leveraging the findings may enable manufacturing SMEs in Malaysia to follow effective plans to improve their innovation level through authentic knowledge that can enhance product and process development.

In nowadays business environment, technological innovation capabilities plays a very critical role that supports SMEs to sustain in the dynamically fluctuating market turmoil for a long period, from the commencing of new ventures until to the phase where firms engage in corporate social responsibility. For this purpose, manufacturing enterprises should start evaluating their level of engagement with TIC. On one hand, for manufacturing enterprises that have not yet been engaging with any TIC, they should consider having one now before any undesirable winding-up take place. On the other hand, for those who have already engaged with some level of TIC, they must continuously improve the existing level of TIC to a higher level for them to ensure the companies' are aligned with the industry's performance and expectations.

It is proven worldwide that organizational capabilities and application R&D is a critical impetus for new product development. This means that more fundamental research investment should be consider by policy makers. To Malaysian SMEs manufacturers, the value of R&D strategies should be given priority in business management. With a proper plan of R&D strategy, it can gives the right direction for gaining enterprise's competitiveness advantage. One way to do this is by inculcate the entrepreneurial orientation

culture in the firm. Successful implementation of entrepreneurial orientation can impulse firm to constantly grab new business opportunities in the competitive worldwide market. The knowledge of experts and organization should be fully utilized managed for solving innovative problem and making effective decisions.

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