

## The antecedents' strategies and processes of product innovation performance

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### CHRONICLE

### ABSTRACT

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Innovation has become unavoidable choice for companies to survive. However, a high percentage of new products fail, which increase the risk of using innovative ideas. Therefore, to control and reduce the risk of introducing new products, most companies need to invent new products that can meet the customers' real needs. Accordingly, customer must be the main source of the information through which the ideas of new products are generated. Having the knowledge about the market needs and trends is not enough as the knowledge needs to be translated into real products. Hence, capabilities, in this context, play a vital role to enhance product innovation performance of the organizations. Thus, this study investigates the role of manufacturing capabilities in enhancing the organizations' abilities to translate the ideas into the right product that can meet customers' needs. Moreover, this paper discusses the link between customer knowledge management and developing manufacturing capabilities. The study is conducted in Malaysia, and uses the information of 134 manufacturing companies for the survey. Partial least square is used to obtain the results. The findings are discussed and compared with other results in the literature.

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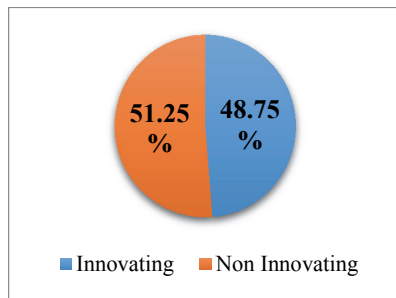
## 1. Introduction

Undoubtedly, innovation has become unavoidable choice for companies to survive. This statement is supported by several studies conducted to explore and determine why and how some companies succeed in achieving desired level of innovation performance while others failed (Tanriverdi, 2005; Taherparvar et al., 2014). Therefore, in order to stand on the main problems faced by companies to be innovative, different countries around the globe, have conducted a series of surveys to determine their innovation levels. In Malaysia, also, six rounds of surveys have been conducted to cover the period from 1994 to 2011, (NSI, 2012). In 2012, the result of the sixth National Survey of Innovation (NSI-6) provided essential information for the formulation and modification of strategies and programs to further enhance

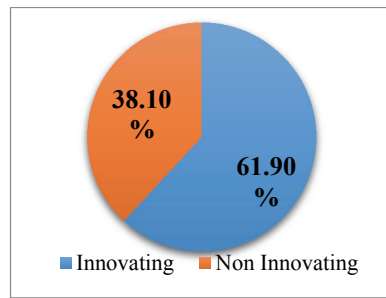
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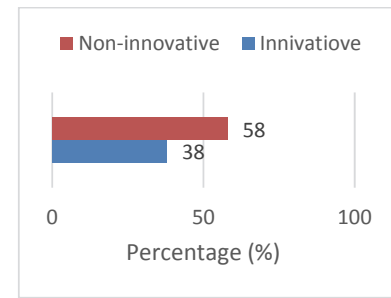
innovation and commercialization practice. Furthermore, the survey indicates the low percentage of innovation of locally-owned companies compared with foreign owned companies, as Fig. 1 and Fig. 2 show below:



**Fig. 1.** the innovating percentage of locally controlled (Source: NSI-5, 2011)



**Fig. 2.** the innovating percentage of foreign controlled Source: NSI-5 (2011)



**Fig. 3.** Innovative and Non-Innovative Companies among the respondents manufacturing companies Source: NSI-5 (2011)

The overall percentage of innovative respondents (i.e., manufacturing companies) indicates the need to pay more efforts in order to enhance the creativity of the manufacturing companies. Fig. 3 shows the percentage of innovative and non-innovative companies. Moreover, the reports regarding the novelty of product innovation were introduced by manufacturing companies to the market during the period of 2012- 2014, which shows the poor performance of this sector. According to the report, the Malaysian manufacturing companies only perform in imitating the existing products in the markets rather than being novel and creative.

**Table 1**

Novelty of New Product or Significantly Improved Products Based on Business Sectors

Novelty of Product Innovation	Number of Product Innovation				Total
	Manufacturing		Manufacturing		
	Yes	%	No	%	
New to the world	4	0.85	465	99.15	469
New to the market	187	39.87	282	60.13	469
Only new to the company	292	62.26	177	37.74	469

Source: NSI-7 (2015)

Malaysian Science and Technology Information System (MASTIC) in its report, NSI-6 (2012) and NSI-7 (2015) points out several factors as hampered factors of innovation efforts of Malaysian companies (i.e., cost factor; market factor; knowledge factor; organizational factor; and regulatory factor/public policy). Moreover, both NSI-6 (2012) and NSI-7 (2015) emphasize on the importance of knowledge and the processes of creating and disseminating knowledge in enhancing the overall innovation performance. Therefore, this study is conducted to explore the strategies that help to enhance the organizations' capabilities to create and to gain the necessary knowledge for successful innovative output.

Innovation performance has been investigated by several studies. The main purpose of previous studies was to determine the best strategies to improve the overall innovation performance of the organizations. In this regards, several strategic approaches have been determined to be related to innovation performance for instance, total quality management (TQM), Entrepreneurial orientation, market orientation, knowledge management, etc., however, organizational capabilities were found to be the most relevant antecedents of the innovation performance in general and product innovation performance in specific (Day, 1994; Yusr, 2016; Day, 1994). Furthermore, Day (1994) stated that capabilities own by the companies considered as one of the main determinants that critically boarder the level of performance. However, in order to leapfrog the competitors, companies need to build up some of the specific capabilities which are more related to the ground battle chosen. Capabilities are among the strategic resources that

build up within the company and strengthen with passage of the time. Hence, certain antecedents are needed to generate the targeted capabilities. The debate regarding the resources and capabilities association concludes that capabilities are results of having certain resources. Therefore, companies need to have suitable resources in order to own the desired capabilities. Hence, the more special resources the companies own, the more distinguished capabilities will be build up which cannot, in most of the cases, be purchased from the market (Teece, 1998). In this regards, the way through which the firms work to gain and create valuable resources and capabilities is the focal area of research that should gain the attention of the scholars (Fahy et al., 2000; Woodman et al., 1993).

Knowledge is among the most valuable assets that all companies may own. According to Knowledge Based Theory (KBV), knowledge is the most strategically important assets the organizations must have and gain it (Grant, 1996b). Moreover, the importance of knowledge as assets has been investigated and proved by several studies (Grant, 1996a, 1996b). Therefore, having knowledge management system within organization became wide practices in most of the companies. Knowledge management processes range from advanced system to simple system such as point of sale. However, reviewing the literature reveals that there is another stream of thought that goes beyond the general concept of knowledge management to be more specific and determined. Customer knowledge management process gains recently the attention of several scholars as enabling of innovation performance in general and product innovation in specific (Hakimi et al., 2014).

The main idea is that customer can be as partner to develop new products successfully. New products are started from the ideas, which could be transferred into new products. The success of these products depends on the adoption rate among the customers. Accordingly, customers are considered as the main source of information regarding the future products. Though the assumption that customer knowledge management affects product innovation performance is well established and there is a need to explain how the gained knowledge from customers could enhance the possibilities of new product to success on the market. Therefore, mediating variable needs to be investigated to achieve the target of this study. As has been mentioned earlier, organizational capabilities are considered as one of the important requirements to achieve and enhance innovation performance. Reviewing literature indicates that most of the past studies investigate the overall capabilities of the organizations. Besides, there is a dearth in the studies that breakdown these capabilities and determine the influence of different kinds of capabilities on product innovation performance. Accordingly, this study tries to reduce this gap and contributes to the body of knowledge by focusing on manufacturing capabilities and its role in enhancing the product innovation performance. Moreover, this study argues that manufacturing capabilities play as mediator that explain the positive influence of customer knowledge management on product innovation performance. However, there are very few studies conducted to examine the mediating role of manufacturing capabilities. Therefore, empirically testing the mediating role of manufacturing capabilities is the primary objective of this paper. Second goal of this study is to test the influence of customer knowledge management on manufacturing capabilities. Besides, the relationship between customer knowledge management and product innovation performance will be the third goal to be achieved in the current paper. Finally, this paper is targeting to assess the relationship between manufacturing capabilities and product innovation performance among SMEs manufacturing companies operating in Malaysia.

## 2. Literature review

The main goal of most of the strategies applied by the organizations is to build and maintain the competitive advantage of the firms. Differentiation strategy is one of the strategies that pinpoints to the importance of competing through maintaining distinctive products throughout the market (Potocan, 2013). Therefore, all efforts and endeavors to develop entirely new products or improve the current products is justified. Keep differentiating the companies' products from being similar to the products of the competitors, becomes an imperative option for the companies to survive. Achieving such aspirant target requests the company to possess several advantages in research and development, marketing, quality, loyalty etc.

in another words, to have capabilities which are difficult to be imitated by competitors (Buble et al., 2003; Potocan, 2013).

Reviewing literature reveals that scholars have different viewpoints to describe capabilities within organization (Buble et al., 2003). However, this study starts to define organizational capability as the ability of firm's to perform a productive task in creating value through the transformation of inputs to outputs. In other word, the integration of knowledge and skills form the capabilities.

However, most of the related literature have considered core skills, core competencies, organizational capital, financial capital, business processes, leadership, etc. as the main sources of capabilities. Capabilities will not have weight if it is simply be imitated, therefore, more valuable capabilities are embedded within the companies' processes. The previous statement is supported by several well-known companies, for instance, Canon, Honda, Wal-Mart, IKEA, etc., where the efforts go to build such capabilities which competitors do not possess (Buble et al., 2003).

Evans et al. (1991) address business strategy as the main block of organization strategy. Moreover, the source of success relies on how far the company is able to alter the main processes within organization into strategic capabilities that offer superior value to the customers. Consequently, supportive infrastructure needs to be build up. To do so, companies have to make so-called strategic investments that leads to facilitate the processes of creating needed capabilities within organization. The difficulties to develop the capabilities make these generated capabilities more distinctive and critical by which the competitors cannot imitate it. In order to have such characteristics in firms' capabilities three key conditions need to be met (Bartmess & Cerny, 1993), first, complexity, where complicated business processes produce critical capabilities. The uniqueness of such capabilities is sourced to the antecedent processes that hard to be imitated by major competitors. Second, organizational diffuseness, valuable capabilities include processes that cut horizontally cross the functional groups in the company and frequently include external groups. Third, well-developed interfaces, capabilities that can create sustainable competitive advantage need to rely on the way that individuals/organizations have learned to work and cooperate with each other as they do on the particular expertise of the individuals/organizations themselves.

In general, the related literature has been classified capabilities into four classifications:

a. Managerial competencies:

Leaders play an important role in determining the strategic vision, articulate and disseminate it throughout the firm, and empower employees to realize that vision. The critical stage of implementing the determined vision is the ability of the top management to acquire and mobilize specialized strategic resources that hope to produce superior returns relative to competitors (Lado et al., 1992). Lado et al., (1992), further, argue that strategic leadership (through managerial competences) is going to play a critical impact on firm strategy and overall performance of the company. Having such competent strategic leadership has been considered as bases of sustainable competitive advantage, as long as these leadership show the characteristics of uniqueness in making use of organization-specific competencies (Lado et al., 1992). This study argue further that the attitude of the strategic leadership is pre-requisite to build, maintain, and develop the organizations' capabilities in different fields as needed and as markets call.

b. Input-based competencies:

This competencies include all human and nonhuman assets such as knowledge, skills, quality system, capital, etc. that allow the organizations' processes to generate and deliver valuable products and services to the customers (Lado et al., 1992; Buble et al., 2003).

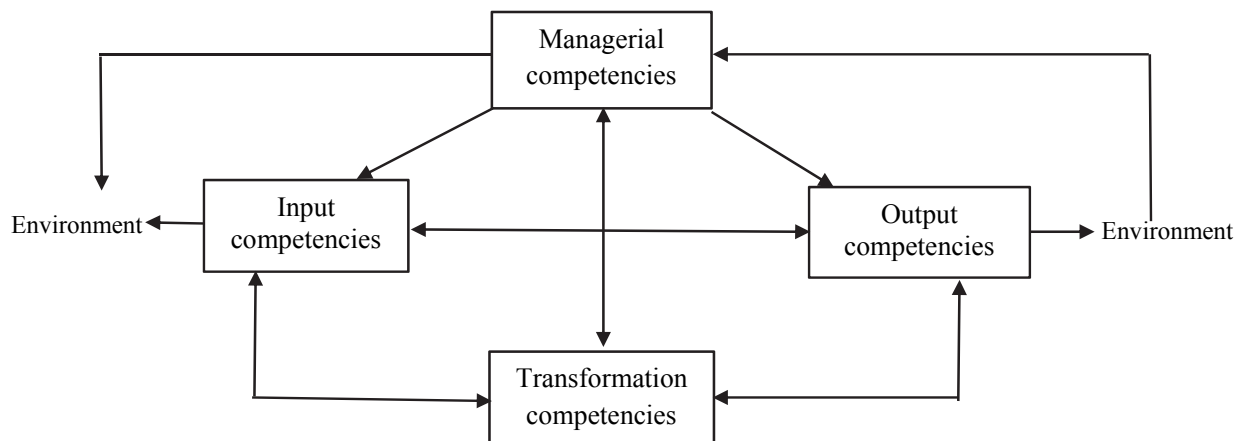
c. Transformational competencies:

Transformational competencies refer to those capabilities that are needed to beneficially convert input into output (Lado et al., 1992). Moreover, transformation competence is related to value chain concept,

where the firm's value chain embraces discrete but connected sets of activities concerned with design, developing, producing, and marketing output to customers (Lado et al., 1992). Buble et al. (2003) add another set of capabilities to be as part of transformation competencies such as innovation capabilities, organizational capabilities, and organizational learning. The current study, further, adopts learning capabilities, manufacturing capabilities, absorptive capabilities, and marketing capabilities to be among transformation competencies of the organizations.

d. Output-based competencies:

Visible and invisible output are included in this competencies for instance reputation, service quality, brand name, networks, image, product/ service, the ability to adapt the products to meet the emerging desires and needs of customers, customer loyalty, and all other advantages that influence the organization's environment (Lado et al., 1992; Buble et al., 2003).



**Fig. 4.** A competency based model

Source: Lado et al., 1992

In sum, any aspect of performance of the company is determined by the internal characteristics of the firm (Potocan, 2013). Throughout the literature, the scholars use different terms to refer to these internal elements, for instance, resources, intangible assets, strategic assets, capabilities, competency, core competencies, etc. (Potocan, 2013). Moreover, several theories, for example, knowledge based theory, resource based theory, capability based theory, and absorptive capacity theory, emphasized on capabilities as main sources of innovation performance. The capabilities, in turn, are derived from several strategies and culture adopted and spread through organization. In this research, therefore, the authors focus on specific capabilities within company which have been considered as vital capabilities (i.e., manufacturing capabilities) which being influenced by CKM processes.

### 3. Manufacturing capabilities

Manufacturing capabilities referred to the proficiency in manufacturing compared to competitors' performance (Avella et al., 2011). The enhancement of knowledge, technology, procedures, processes and market input through manufacturing capabilities, which in turn leads organization to become skilled in manufacturing products and services (Kocoglu et al., 2012). Sarmiento et al. (2007) further explained manufacturing capabilities as the capability of manufacturing production system to compete and provide the basic dimensions, including cost, time, flexibility and quality.

Avella et al. (2011) mentioned four classic manufacturing capabilities dimension, such as cost, time, flexibility and quality. Cost may be referred to the ability in manufacturing to produce products with low cost, while time related to the aspect of speed in delivering products and the reduction of production lead

times or waiting time period. Flexibility or agility is the third dimension of manufacturing capabilities. It involves the ability to increase and react to the dynamic of market changes, customer needs and competition in the marketplace, meanwhile the capability in producing high quality products is essential for manufacturing industry to compete with its rivals. As summarized, these four capabilities are seen to be the most important dimensions in manufacturing industry (Größler & Grübner, 2006; Alqasa & Al-Matari, 2014). Tracey et al. (1999) conducted a study on six manufacturing industries in United States stated that manufacturing capabilities influence firm innovation performance. According to Swink and Hegarty (1998), there are three core capabilities that urge firm to change in order to achieve manufacturing effectiveness. Firms are required to make improvements to increase the efficiency and productivity of the existing manufacturing resources. Apart from improvement, innovation is the second core for firms to improve manufacturing performance through the implementation of new resources and ideas. Third, integration is the ability of firms to expand the operations and provide products and services that meet customer's needs. The abilities of firms are crucial to compete in a dynamic and competitive environment.

Manufacturing capabilities supports strategic objective of the firm based on the performance of the manufacturing. Particularly, the performance of the firms provides a measure between manufacturing capabilities and competitiveness in the marketplace. In other words, organizational performance determines the performance of manufacturing and contributes to the success of a firm (Swink & Hegarty, 1998). Größler and Grübner (2006) highlighted manufacturing capabilities as a bi-directional relationship, which focused internally and external perspectives of a firm. Manufacturing firm becomes a strong competitive force by offering innovation strategic opportunities with the presence of bi-directional exchange process.

Furthermore, there are two points that explain the development of manufacturing capabilities. Firstly, high performance levels of manufacturing capabilities can be achieved through cumulative capabilities and rigid-flexibility model. Specifically, cumulative capabilities model is a sequential improvements across manufacturing capabilities, while rigid flexibility is a concept which focuses on manufacturing capabilities dimension, such as cost, time, flexibility and quality. Secondly, multiple high level performance can be achieved with or without both cumulative capabilities and rigid-flexibility models. Performance can be found at the highest level of the industry or in a "compatibility" situation (Sarmiento et al., 2007).

Swink and Hegarty (1998) pointed out three roles of manufacturing capabilities involved in the formulation of strategy. The first role of manufacturing capabilities is to classify important capabilities between manufacturing outcomes and means as well as addressing the need and how it is delivered. Secondly, an understanding of manufacturing objectives is needed to achieve strategic manufacturing initiatives. In particular, needed capabilities provide a dynamic basis for improvement and a view of manufacturing capabilities is essential in maintaining strategic goal. Lastly, it is essential to understand manufacturing capabilities and provide insights to compete in the marketplace and converting manufacturing policies and hardware into product attributes.

#### **4. Customer Knowledge Management**

Knowledge is the information shared with experience, context, interpretation and reflection, while knowledge management is the main factor behind or inside the success of firm. Knowledge management is a process of capturing, collecting and applying the best practice for firm. Customer relationship management is concerned with developing and maintaining long term relationship with profitable customers and stakeholders. Specifically, customer relationship and knowledge management are two different approaches and perspectives in integrating customer knowledge management. Likewise, customer knowledge management is the application of knowledge exchange between firm and customer retention (López-Nicolás & Meroño-Cerdán, 2008).

Feng and Tian (2005) mentioned customer knowledge management related with the interaction between firm and customers. There are three types of customer knowledge management, including knowledge about customer, knowledge from customer and knowledge for customer. Knowledge about customer is knowledge of firm to reach and understand targeted customer better, such as customer database for every transaction and personal preferences. Particularly, knowledge about customer enhances long-term business operations between firm and customer as well as accumulates the knowledge as a valuable knowledge for firm. It is a foundation for improving and optimizing customer relationship in present state and future purchasing process.

Furthermore, knowledge from customer is the second type of customer knowledge management. It refers to the information, feedback and suggestion that customer holds about products, including thoughts, ideas, customer's preferences, and experience of specific products or services. Knowledge from customer helps firm understand about competitors' products, make improvements based on customer's suggestion and directly create customer relation network between customers (Feng & Tian, 2005). The last type of customer knowledge management is knowledge for customer. Knowledge for customer is the dissemination of knowledge by firm to customer in order to provide better understanding of products and services offered by firm. Nevertheless, it enhances customers to make better purchase decision and better use of the products, such as changing customer's preferences and increase demand of products. Therefore, utilizing and maintaining information helps firm obtain customer mix and experience (Feng & Tian, 2005).

### **5. Relationship between customer knowledge management and manufacturing capabilities**

Previous study conducted in manufacturing firms revealed that customer knowledge management plays an important role in determining manufacturing firms. Study conducted by Kogut and Zander (1992) proved positive and significant relationship between customer knowledge management and manufacturing capabilities. Yam et al. (2011) in Hong Kong studied the relationship between customer knowledge management and manufacturing capabilities. The study found that in electronic devices such as electrical appliances, toys, machineries, watch and clock industries there was a strong influence on customer knowledge management and manufacturing capabilities. Study on computer manufacturers also found the same finding in Taiwan and showed the same positive and significant relationship between customer knowledge management and manufacturing capabilities (Lin et al., 2010). Furthermore, through the information obtained from the customers the organization will be able to determine the path that the companies need to follow to upgrade and improve their capabilities that can meet the real needs on the market. Therefore, maintaining the relationship with customers especially business customer will help to keep the company further step ahead compared to their competitors.

Thus, the following hypothesis is introduced.

H1: there is a significant relationship between customer knowledge management and product innovation performance.

### **6. Relationship between manufacturing capabilities and product innovation performance**

Previous study conducted by Wang et al. (2008) on manufacturing firms in Taiwan found that manufacturing capabilities significantly related to innovation performance. Specifically, manufacturing capabilities are able to transform R&D into product improvements and processes in product quality. This is similar to the study conducted in China manufacturing industry by Guan and Ma (2003) and Yam et al. (2004) also revealed the same relationship between manufacturing capability and innovation performance.

Zhang et al. (1999) conducted a study on six manufacturing industries in United States stated that manufacturing capabilities influence firm innovation performance. Other studies such as telecommunication industry in China also concluded that technological capability had significant impact on product innova-

tion (Zhou & Wu, 2010; Wu et al., 2013). Particularly, technological capability is the dimension of manufacturing capability and this study significantly influences innovation performance of products. As technological capability embedded in firms, it leads firms become valuable, inimitable and non-substitutable. The critical role of technological capability enhances innovative product and processes.

According to Zhang et al. (2002) manufacturing capability influences the level of innovation performance. It was further explained that flexibility in manufacturing capability as the efficiency and dependability in the market place. This capability maintains performance of products whether modifying existing products or designing new innovative products. The same result was found by Kocoglu et al. (2012) in Turkish manufacturing firm that manufacturing capabilities, such as quality, cost, flexibility and time would be a key source for firm's innovation performance.

Moreover, manufacturing industry in United States also found the same positive and significant relationship between manufacturing capabilities and innovation performance (Swink & Hegarty, 1998). Tatikonda and Weiss (2001) in their study in manufacturing firm also concluded that manufacturing capability had significant and positive relationship with innovation performance. Similar result was proven by Amara and Landry (2005), on the relationship between manufacturing capability and innovation performance. Technological and R&D dimensions were tested to see the influence of product novelty in manufacturing industry and it showed positive and significant relationship.

In addition to that, Tourigny and Le (2004) found significant and positive relationship between manufacturing capabilities and innovation performance in Canada manufacturing firms. It showed that manufacturing excellence and strategy of a firm successfully influence novelty of product performance. This relationship was further explained by Reichstein and Salter (2006) in their study on manufacturing firms in United Kingdom found that manufacturing capabilities significantly influence innovation performance. It can be explained that manufacturing capabilities is the source of incremental and radical process innovation.

However, Antonio et al. (2007) found that manufacturing capability had no relationship with innovation performance on toys, electronic and plastic manufacturing firms in Hong Kong. This was also proven by Rosenzweig et al. (2003) who found manufacturing capability had little or no significant relationship for innovation performance.

Therefore, the following hypothesis formulated.

H2: there is a significant relationship between manufacturing capabilities and product innovation performance.

## **7. Relationship between Customer Knowledge Management and Product Innovation Performance**

Previous studies have revealed that customer knowledge management plays an important role in determining innovation performance of a firm. Hence, the study has been conducted in Korea firms proved a positive relationship between customer knowledge management and innovation performance (Lee et al., 2005). A study conducted by Carneiro (2000) found that customer knowledge management has positive and significant impact on innovation performance. Contribution of knowledge and new insights by employees leads to the increase the innovation performance and customers' relationship. The same results were found by Harari (1994) and Nonaka (1994), where they reported positive and significant relationship between customer knowledge management and innovation performance. As the increase of customer knowledge management by firms, it represents that firms are prepared for changes and improve in innovation performance.

Darroch (2005) in the study in New Zealand manufacturing firms found that customer knowledge management has positive and significant impact on innovation performance. Moreover, Gloet and Terziovski (2004) in their study on manufacturing companies across large range of industries in both private and



public sector in New Zealand also found that customer knowledge management practice the important driver to enhance innovation performance. These findings are similar to the study conducted by Carnegie and Butlin (1993) who found that knowledge management in customer perspective supports creativity and improve innovation. In addition, a study on manufacturing firms in Canada also has proven the same positive relationship between customer knowledge management and innovation performance. Customer knowledge development increases customer knowledge and keep pace with customers' demand to produce an ongoing new products development (Joshi & Sharma, 2004). López-Nicolás and Meroño-Cerdán (2011) studied the relationship between customer knowledge management and innovation performance on textile, food and agriculture, food trading and services companies in Spain. Choy et al. (2006) and Nonaka (1994) also reported similar findings.

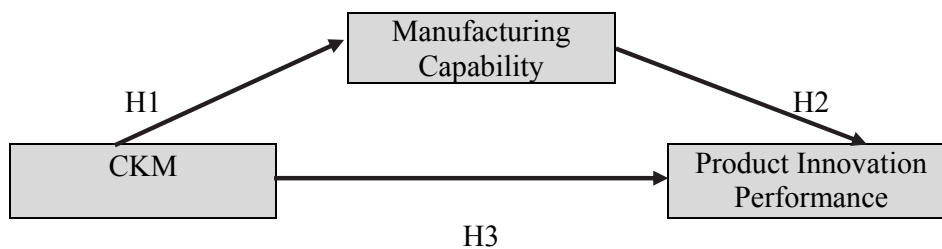
In Denmark, a study conducted on manufacturing firms also found that customer knowledge management has a positive and significant relationship impact on innovation performance (Lundvall & Nielsen, 2007). Luca and Atuahene-Gima (2007) also found that in China manufacturing firms there was a positive and significant relationship between customer knowledge management and product innovation performance. Other studies also stated positive and significant relationship between customer knowledge management and innovation performance. The researchers further explained that high capability in knowledge management will enhance high innovative performance organization. In addition, Noruzy et al. (2013) in their study found that customer knowledge management and organizational innovation performance positively and significantly influence the performance of the firms in Iran large and small scale manufacturing companies, such as food industry, car utility manufacturing companies, pipe and faucet industries, electric utility companies and clothing industries. Taherparvar et al. (2014) in their study on banking sector in Guilan reported that customer knowledge management had significant and positive relationship impact on business performance.

Tanriverdi (2005) in United States studied the relationship between customer knowledge management and innovation performance. The study found that customer knowledge management had a strong influence on innovation performance. Zack et al. (2009) found the same findings in their study on customer knowledge management practices and organizational innovation performance in United States and Canada manufacturing industries.

Accordingly, the following hypothesis is introduced.

H3: There is a significant relationship between customer knowledge management and products innovation performance.

#### *Research framework*



**Fig. 5.** The framework of the study

## **8. Methodology**

This study was conducted in Malaysia targeting SMEs manufacturing companies operating in main peninsula. The questionnaire was the tool by which the data was collected, where 18 items to measure the constructs were adapted from relevant previous studies (Hakimi et al., 2014; Prajogo & Sohal, 2006;

Yam et al., 2004, 2011). A total of 350 questionnaires were sent to the factories aiming to secure minimum of 150 valid returned questionnaires. Finally, after using all available efforts and resources to collect needed data the researchers manage to get 134 valid questionnaires during a period of nine months. The obtained number of valid questionnaires represent 38% of the total questionnaires that have been sent. This percentage is considered acceptable among studies that use organizations as unit of analysis. The difficulties to get reached to the respondents is on top of the reasons to accept this percentage.

The respondents included the general managers of manufacturing, operation manager, marketing manager, and R&D manager. The mentioned positions were targeted due to the relevant knowledge they own which will reflect the validity and reliability of the provided answers used to analysis the data. Partial least square PLS-3 was the analysis approach used to test the formulated hypotheses. First, the hypotheses reliability and validity of the instrument have been examined to confirm the relevant of the items to test the respective constructs. For that, this study adopted the suggested threshold by several authors Hair et al. (2011); Henseler et al. (2009); Hulland (1999) for the Composite Reliability more than 0.7, average variance extracted (AVE) more than 0.5, and reflective indicator loading more than 0.5. Table 2 and Table 3 describe the main obtained results.

**Table 2**  
The reliability and validity of constructs

Construct and Items (Item Code)	Internal Reliability	Convergent Validity	
	Composite Reliability	Factor Loading	AVE
<b>Customer Knowledge Management-Enabled Innovation (CKM)</b>			
You usually meet in order to exchange ideas about customers during the innovation process	0.876	0.831	0.639
Marketing personnel spend time discussing customers' future needs with other departments		0.797	
You tend to learn from your previous experiences with customers to succeed in innovation projects		0.747	
Customers feedback helps you to rectify new products/services after their diffusion		0.821	
<b>Manufacturing Capabilities (MACAP)</b>			
The manufacturing department in our company has a great contribution during the conceptual design stage in innovation process	0.915	0.836	0.728
The manufacturing department in our company has a high ability to transform R&D output into production		0.810	
Our company effectively applied advanced manufacturing methods		0.912	
Our company has a high degree of manufacturing cost advantage		0.853	
<b>Product Innovation Performance (PIP)</b>			
Number of new product introductions is high compared to other competitors	0.934	0.895	0.780
Compared to other competitors, our company is faster in bringing new product(s) into the market		0.860	
Our company encourages the new ideas presented to develop the new products		0.921	
Our new product introductions has increased over the last 5 years		0.855	

**Table 3**  
The Discriminant validity of the constructs

Constructs	CKM	MACAP	PIP
CKM	<b>0.800*</b>		
MACAP	0.578	<b>0.854*</b>	
PIP	0.516	0.772	<b>0.883*</b>

\*AVE square root values

Looking at the above tables, the validity and reliability along with discriminant validity have been achieved by the study. Therefore, it can be concluded with confident the goodness of the model. Having established instrument to test the model pave the way to go to the send step which is testing the structural model (i.e., testing the hypotheses). Table 4 indicates the results of the structural model.

**Table 4**  
Result of testing hypotheses

Hypotheses	Original Sample	Sample Mean	Standard Deviation	T Value	P Values	Result
CKM <sub>1</sub> → MACAP	0.578	0.583	0.055	10.570*	0.000	Supported
CKM <sub>1</sub> → PIP	0.104	0.110	0.072	1.445	0.149	Not Supported
MACAP → PIP	0.712	0.711	0.080	8.846*	0.000	Supported

Significant at \* ( $p < 0.001$ )

Table 4 shows the results of the formulated hypotheses where all hypotheses have been supported except hypothesis H2 which was not supported. To determine the presence of mediating and the significant of this mediating role, the approached proposed by Preacher and Hayes (2008) was adopted and the result in Table 5 shows that MACAP was fully mediated the relationship between CKM and PIP. The table also shows that the mediating path was significant and MACAP fully mediated the relationship between CKM and PIP. The following section will display the discussion and the conclusion of the study.

**Table 5**  
The path coefficient of mediating path

Direct path	Path <i>a</i>	Path <i>b</i>	Indirect Effect	SE	T-value	P-value	95% LL	95% UL
CKM-PIP	0.578	0.712	0.41	0.0539	7.63*	0.000	0.31	0.52

Significant at \* ( $p < 0.001$ )

## 9. Results, findings and conclusion

Finding the best strategy to enhance the percentage of successful new products of Malaysian manufacturing companies was the main goal of this paper. To achieve that, a comprehensive reviewing process throughout the relevant literature has been accomplished. As a result the model of this study has been introduced. By assessing the nature of the relationship among the constructs included in the model the main goal of this paper was attained. Basically, this paper has investigated the role of CKM in enhancing the PIP. In another words, how far relying on knowledge obtained from customers will increase the adoption rate among the customers towards the new products in the market. This study, furthermore, was looking to examine the indirect effect of CKM on PIP through MACAP. To do so, this study targeted general managers, operation manager, marketing managers and R&D managers to be as the respondents of this research. Before evaluating the introduced hypotheses, the model was subjected to all suggested procedures to ensure the goodness of the model. After all, the findings indicate that CKM has positive relationship with MACAP ( $\beta = 0.578$ ,  $t = 10.57$ ,  $p > 0.001$ ). This result, moreover, support previous studies that claim the role of CKM in enhancing the MACAP of the organizations. However, it is important to mention here that companies need to differentiate the kinds of the customers from which they are going to get the information. As it is well known, there are two types of customers; business customer and individual customers. In the context of upgrading the processes and making decision regarding new products, organizational capabilities more credits go to business customers than individual customers. This finding, also, supports the importance of building strategic partnership with business customer. This study, however, does not neglect the role of individual customers. Rather it emphasizes on the role of final customer as a source of knowledge, but not to be source for making decision. Knowledge acquired from customer needs to be subjected to screening processes with specific criteria. To sum, both customer (i.e., business customer and final customer) are important to direct the efforts of the companies to build and enhance their capabilities to be in line with the market needs, however, the business customer plays the major role.

This conclusion, moreover, is supported by the obtained results by this study where the H2 was not supported indicating that there was no significant relationship between CKM and PIP ( $\beta = 0.104$ ,  $t = 1.445$ ,  $p > 0.149$ ). Though this result is in contradict with the conclusion of other past studies, this finding

is justifiable depending on what kinds of innovation we are talking about. It is well known that there are two general categories of innovation which are radical innovation and incremental innovation. Talking about incremental innovation, this kind of innovation happens step by step, where it is more about improvement in the existed products in the market. Such kind of improvement or incremental innovation happened with the help of customers through their complaint, problems they face in handling the products, suggestions, etc. On the other side, talking about radical innovation, it is a process that relies more on knowledge related to the relevant discipline. Therefore, it is a result of R&D processes, however, these R&D processes need to have some lights from market and individual customers.

Therefore, the authors argue that developing new products is a result of continuing improvement and researching processes. Thus, this study believes that knowledge from the related discipline is more important and critical in the processes of developing new products. However, this argument does not against considering customer as source of knowledge, it rather emphasis on the major role of internal processes in introducing new products. Customers remain as major partner that determine the success of new products. Being market oriented and customer focus is one of the approaches that prove its role in enhancing the performance and the survival of the organization in the market. Customers can be as a source that generates the idea for future need. Therefore, the complementary role of CKM is important for the success of new products, but not as the major role.

Another result of this study shows that there was a significant positive relationship between MACAP and PIP ( $\beta = 0.712$ ,  $t = 8.846$ ,  $p > 0.000$ ). This result is compatible with past studies for instance Yam et al. (2004); Kocoglu et al. (2012) and others. Moreover, several studies have determined capabilities as the antecedents of innovation performance. This positive relationship could be justified further by looking at the role of such capabilities to translate the generated idea into real products. Talking about MACAP means we are talking about the characteristics that put the company in advance step compared with competitors. Flexibilities is one of the MACAP to adjust its products' processes to produce different kinds of products or even to improve the current products. Having Six Sigma belt is one of the distinctive capabilities that refer to the organization's abilities to master its processes with zero defects. Therefore, all processes that lead to maintain and reduce the total production cost considered as MACAP that related to enhance PIP. In another words, having the abilities to control the cost aspects during the production processes will reduce the risk.

This results, further, justifies the non-significant relationship between CKM and PIP in the designed model of this study. This result, moreover, is in line with Yusr et al. (2017). As explained earlier, CKM cannot affect the PIP unless the company has the capabilities to take an action according the feedback of the customers. Therefore, organizational capabilities and MACAP are among the aspects that determine the companies' abilities to have suitable response to the feedback obtained from customers. This discussion, further, has been supported by the obtained result in the current study. Where MACAP is fully mediates the relationship between CKM and PIP.

## 10. Implication of study

On the theoretical level, this study provides some statistical evidence of the role of MACAP in enhancing the PIP. Therefore, it is highly recommended to the decision makers to pay more attention in building and reinforcing their capabilities to manufacture the products. To be more flexible is one of the criteria that upgrade the organizations' abilities to develop varieties of products without requesting of major modifications in production lines, which in turn, will decrease the production cost of the processes. However, this flexibilities must be guided by the feedback getting from the markets and more specifically from the customers. This study, also, supports stream of thought that state that CKM positively influences the MACAP of the firms. Hence, companies need to integrate the feedback obtained from the customers into all efforts that target building and reinforcing the firms' capabilities. Noticeably, the finding of this study shows that MACAP is fully mediate the relationship between CKM and products innovation performance, where the direct path between the two constructs exists (i.e., CKM and products innovation

performance disappeared in the presence of MACAP). This finding indicates that both CKM and MACAP are predictors of PIP. However, the feedback from customers must be supported by the organizations abilities to respond in the form of new products and new features in the existing products. Therefore, the output of this study justifies the resources allocated to build organizational capabilities. In other words, decision makers of manufacturing companies in Malaysia need to pay more efforts and allocate extra resources to enhance their MACAP in order to enhance the adoption rate of new products among the customers.

To enhance the generalizability of these finding, future studies need to be conducted to include other sector beside manufacturing sector. Moreover, the data collected by this study did not differentiate between business customers and final customers. Manufacturing companies normally deal with both kinds of customers especially if they are going for online sale. Therefore, in order to determine the most critical partner in developing new products, it is recommended for future studies to separate the items to differentiate between these two kinds of customers. This study has evaluated MACAP, thus, it is highly recommended for future studies to include another kinds of capabilities to determine which capabilities need to be emphasized more in developing new products, or the set of capabilities that need to be available to reinforce the processes of developing new products.

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