The Impact of Products and Processes Innovation on Business Performance of Manufacturing SMEs in Mexico

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Abstract
The market globalization, the high level of competitiveness and business uncertainty in; all characterize the current 21st century, in which enterprises, primarily Small and Medium-Sized Enterprises (SMEs), seek to adapt its business strategies not only to increase its markets share but also to survive in an environment of economic turbulence. For this reason, today innovation is emerging as a business strategy that allows organizations to differentiate its products from its main competitors, as well as significantly improve its level of business performance. Thus, the results obtained in this research demonstrate that both innovation in products and innovation in processes have a significant positive impact on the business performance of SMEs in the State of Aguascalientes.

Key Words: Products Innovation, Processes Innovation, SMEs, Performance.

Introduction
Currently the interest of researchers, academics and business science and management professionals has increased in the literature by innovation activities in a context of Small and Medium-Sized Enterprises (SMEs) (Nauwelears & Wintjes, 2002; Matzler, Schwartz, Deutinger & Harms, 2008). Possibly this incessant interest of researchers and academics is motivated by the importance of SMEs in the economy and society of both developed countries and emerging countries (Matzler et al., 2008), since for example SMEs employ approximately to slightly more than half of the total of employees in United States (Ackelsberg & Arlow, 1985; Bauer, 2002), and in Mexico such enterprises employ more than 60% of the total active population (INEGI, 2009).
Despite the importance that SMEs have for economic and social development and growth of any country in the world, most of the analysis and discussion of innovation activities in the current literature have focused on large companies. Only few studies have focused on the innovation management in SMEs (Matzler et al., 2008), as for example, data from Australia indicate that activities of innovation, especially in products and processes, are relatively low in SMEs compared with those obtained in large companies (Österreichischer Wirtschaftsbund, 1989), the same is true in Aguascalientes region of Mexico, in which innovations in products and processes in the manufacturing SMEs have lower levels than those achieved in large companies (Martinez, Garcia and Maldonado, 2010).

In this sense, some researchers and scholars (e.g. Julien et al., 1999; Huang et al., 2002; Roessl et al., 2007) concerned with this issue and with a lack of information about this, by the end of the 90’s they began to publish some studies. They demonstrated that the effectiveness and efficiency of innovation activities in SMEs, analyzing on the background and consequences of innovation activities, for example, the use of technology in the process of new products development (Julien et al., 1999; Huang, Soutar & Brown, 2002), innovation in marketing (Roessl et al., 2007), which were developed in the context of SMEs and provided valuable information for researchers, academics and professionals in business science. Additionally, it offers theoretical and empirical evidence about the relevance of innovation in this kind of companies.

Other researchers analyzed in more detail the low degree of formalization that SMEs have in the introduction of innovation, both in processes and products; this represents a barrier to innovation (Herstatt, Lüthje & Verworn, 2001). Similarly, Meyer (2001) implemented a checklist and brainstorms to develop new products in SMEs, finding a relationship between both constructs. Other investigations in SMEs, discussed the formal procedures for the development of new products and processes (Kleinknecht, 1987; Santarelli & Sterlacchini, 1990), and other investigations were based on the creativity and talent of individuals, of the company, to develop new products and processes (Kao, 1983).

Even with these investigation publications, the analysis and discussion of innovation in products and processes and its impact on business performance have received less attention by researchers, academics and professionals from business science. Therefore, a contribution from this empirical research is to provide empirical evidence about the existing relationship between products and processes innovation and business performance in SMEs from an emerging country (i.e. Mexico). Besides, another contribution is a methodological aspect, the use of a structural equation model to response the following formulated hypotheses, as there are few studies that use this important statistic technique.

Materials and Methods

Despite innovation activities in SMEs are considered essential in market growth and development and in the economy of modern societies, products and processes innovation have focused to a greater extent on large firms (Hatch & Mowery, 1998; Reichstein & Salter, 2006; Ettlie, 2006). As a result, the attributes associated with products and processes innovation in businesses, generally these are considered fuzzy and elastic (Reichstein & Salter, 2006). Thus, obviously, only some of these attributes are considered important by companies (Rosenberg, 1982; Damanpour & Gopalakishnan, 2001).

Similarly, there is a debate in the literature on innovation in relation to the measurement of its performance, which generates confusion in companies (Huang & Rice, 2012), but from many measurements published in the current literature several researchers and academics have concluded that the measurement of innovation performance can be through products and processes innovation (Laursen & Salter, 2006; Lichtenhaler, 2008; Bahemia & Squire, 2010; Grönlund et al., 2010). However, products innovation is a common measurement of business performance and innovation in processes has been widely ignored in terms of their importance to measure business performance (Reichstein & Salter, 2006).
In this sense, innovation usually can be measured through two essential elements. First, it can be made by the change or improvement in current products offered by the company to customers and consumers. Second, by the changes or improvements made to models (processes) to generate products (Damanpour & Gopalakishnan, 2001). These two measurements of innovation correspond to products and processes innovation are the most commonly used in the literature to measure the effects of innovation on business performance (Tidd et al., 2001), where products innovation focused on what is produced in SMEs, and processes innovation on how these products are produced (Edquist et al., 2001).

In addition, products innovation can be strategically used by companies to differentiate itself from competitors; to meet market needs, to generate a higher level of consumer’s loyalty and to provide a higher level of economic performance (Damanpour, 1991; Brown & Eisenhardt, 1995; Damanpour, 1991; Brown & Eisenhardt, 1995; Damanpour & Gopalakishnan, 2001; Edquist et al., 2001). Likewise, processes innovation represents a critical change to production processes within the company since this form of innovation has been commonly considered an essential variable with a strong impact on the business performance, particularly SMEs (Hatch & Mowery, 1998; Reichstein & Salter, 2006). On the other hand, in a business environment characterized by rapid market changes, by a variety of customer requirement and by a high level of international competitiveness, organizations, mainly SMEs, have to acquire and develop new capabilities and to explore new business models; in such a way that not only allow them to remain in market, but to obtain a higher level and long term performance (Vanhaverbeke & Peeters, 2005). Therefore, innovation facilitates compliance with customers’ requirements through the introduction of new products and processes and it appears today increasingly implemented in a larger number of companies, as one of the most important variables that have greater impact on business performance (Murat & Baki, 2011).

In this sense, innovation commonly facilitates the creation of a sustainable market in both short and long term, through the introduction of new or improved products and processes (Carayannis & González, 2003). Therefore, several researchers and academics came to the conclusion that businesses, especially SMEs, can be more competitive if they adopt and integrate innovation in its daily activities (de Jong & Vermeulen, 2006; Hui & Qing-Xi, 2006; Weber & Weber, 2007). Thus, innovation plays a key role in the growth and development of companies, steadily increasing the level of business performance, improving the levels of competitiveness, and creating a better standard and quality of life for workers and employees (Gopalakrishnan & Damanpour, 1997).

Similarly, one of the most important issues in innovation activities is the firm size, even when the existing relationship among these two constructs have been analysed by diverse researchers and academics, most of the investigations have been focused on large firms, which have more advantages than SMEs (Murat & Baki, 2011). However, today SMEs have more contributions in innovation activities and play an essential role as businesses generating innovations that facilitate growth and development in the economy of any country, as demonstrated by Hyvärinen (1990), McAdam et al. (1998), Avermaete et al. (2004), Freel (2005), Yap et al. (2005), Allocca and Kessler (2006), de Jong and Vermeulen (2006), Oke et al. (2007), Dibrell et al. (2008), Matzler et al. (2008) and Murat and Baki (2011).

At the same time, other investigations have recently analysed and discussed the existing relationship between innovation and business performance in developing countries and consequently, the development and implementation of market policies (Radas & Bozic, 2009). Therefore, with the objective to contribute to the analysis and debate about the existing relationship between innovation and business performance, the present research work is oriented to the search of empirical evidence of this relationship in a country of emergent economy, as the case of Mexico.

On the other hand, there is a strong debate in the literature about what innovation is, how many types of innovation are and if innovation presents various stages, as for example, products and processes innovation, radical or incremental, administrative or technological (Santos-Vijande & Alvarez-Gonzalez, 2007).
Therefore, frequently various investigations published in specialized literature in marketing and management have used products and processes innovation as the most representative types of innovation activities, as seen in Prajogo et al. (2004), Wang and Ahmed (2004), Avermaete et al. (2004), Leiponen (2005), Freel (2005), Tang (2006), Matzler et al. (2008) and Murat and Baki (2011).

These researches have a clear distinction between innovation in products and processes, which are related with areas and activities of innovation, and the effects that this one has on businesses, for example, business performance (Gopalakirshnan & Damanpour, 1997). Likewise, innovation in products is considered to be the creation of a new category of products or the implementation of changes in small scale of existing products for the benefit of consumers, and innovation in processes is defined as all that tool, device, and knowledge that usually are associated to existing technology in a firm, to mediate between deliveries of raw materials and components and production of a given product (Gopalakirshnan & Damanpour, 1997; Langley et al., 2005).

Then, innovation activities are totally different, firstly, from the kind of innovation that is implemented and, second, if it is carried out in an industry, an organization or only in a production line of a particular SME. For example, if a SME has the firm intention to adopt and to implement innovation in products, it can be concentrated in the development of a new product or only to improve technology to develop new business methods, such as process innovation, which are orientated to knowledge management for workers, employees, managers or in a business culture that SMEs have, which may lead to a higher level of business performance (Murat & Baki, 2011).

In other words, when a business is implementing innovation activities and wants to implement them in any of its existing products it can include such activities in the development of new offered products or to implement small changes or adjustments on existing products. Any decision that the SME make it will require developing a process innovation, most of all on production processes, or the implementation of new processes methods. Alternatively, it can only make small changes or adjustments in its methods and production and management systems, in order to be ready to produce new products (Oke et al., 2007). In this sense, SMEs that have taken the decision to adopt and to implement a products and processes innovation, not only have to adopt new products to market changes, but to generate greater levels of flexibility on its supply chain (García-Morales et al., 2007), mainly because according to Mone et al. (1998) the business innovation capabilities are fundamental to increment the business performance. Therefore, those enterprises that have adopted and implemented innovation activities in products and processes commonly have higher business performance than those that have not adopted nor implemented it (Cozzarin, 2004).

Thus, the existing relationship between products and processes innovation and business performance has been analysed by various researchers and academics. For example, by Deshpande et al. (1993), who researched Japanese companies and found that innovation activities have a positive and significant relationship to business performance. Another research by Baldwin and Johnson (1996) demonstrated a positive and significant relationship between innovation activities and business performance in Canadian. Similar results were obtained by Güles and Bülbül (2003) in their research on manufacturing companies in Turkey, they found that innovative enterprises have greater levels of business performance in those companies that have not implemented innovation activities.

Another research carried out by Erdil and Kitapci (2007) show that companies that have constantly adopted or implemented products and processes innovations have positive and significant effects on business performance. Besides, Prajogo and Ahmed (2006) identified the same relationship. However, in this sense, Akgün et al. (2007), who found that processes and products innovation, influenced by the emotional and learning skills, have a positive and significant impact on business performance. Based on the previous assumptions we introduce the following hypothesis:
H1: Products innovation has a positive and significant relationship with business performance.
H2: Processes innovation has a positive and significant relationship with business performance.

In order to define the sample size in this research, the businesses directory offered by the Mexican Business Information System (SIEM by its acronym in Spanish) in Aguascalientes region in Mexico. This database had registered 7,121 companies on August 30 in 2010, and for this research, only businesses that have from 5 to 250 employees, which reduced the sample to 1,122 SMEs. Moreover, it was random sampling with a maximum error of ±4.5% and a confidence level of 95%, having a total sample of 326 surveys, which were applied through a personal survey to SMEs managers, during January to June in 2011, having a total of 308 validated surveys, and therefore, a response rate of 94%.

In relation to the measurement of variables in this research, the variable of products innovation was measured through a 5 items scale. While, the processes innovation variable was measured by 4 items scale, being adapted by Pinzón (2010) and the Oslo manual (2010). Equally, business performance was measured by a 10 items scale and adapted from García (2010). All items form the three variables used are constructed with a Likert 5 scale; where 1 = totally disagree and 5 = Totally agree. In this empirical research, there was a reliability and validity analysis of the variables, as previous step to results analysis.

For that, a Confirmatory Factor Analysis (CFA) was applied, using the method of maximum likelihood with EQS 6.1 software (Bentler, 2005; Brown, 2006; Byrne, 2006). In addition, the reliability of the scales was measured through the Cronbach alpha and Composite Reliability Index (CFI) to determine the reliability of variables, this defined by Bagozzi & Yi (1988), which provide sufficient evidence of internal reliability of scales (Nunally & Bernstein, 1994; Hair et al., 1995).

Table 1. Internal Consistency and Convergent Validity of the Theoretical Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicator</th>
<th>Factor Load</th>
<th>Robust t value</th>
<th>Cronbach Alpha</th>
<th>CFI</th>
<th>EVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Products innovation</td>
<td>IPC1</td>
<td>0.862***</td>
<td>1.000***</td>
<td>0.947</td>
<td>0.947</td>
<td>0.783</td>
</tr>
<tr>
<td></td>
<td>IPC2</td>
<td>0.884***</td>
<td>31.431</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPC3</td>
<td>0.845***</td>
<td>24.315</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPC4</td>
<td>0.908***</td>
<td>31.521</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPC5</td>
<td>0.919***</td>
<td>33.290</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processes innovation</td>
<td>IPR1</td>
<td>0.898***</td>
<td>1.000***</td>
<td>0.961</td>
<td>0.960</td>
<td>0.858</td>
</tr>
<tr>
<td></td>
<td>IPR2</td>
<td>0.920***</td>
<td>30.594</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPR3</td>
<td>0.943***</td>
<td>28.468</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>IPR4</td>
<td>0.944***</td>
<td>30.784</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Performance</td>
<td>PER1</td>
<td>0.839***</td>
<td>1.000***</td>
<td>0.964</td>
<td>0.964</td>
<td>0.727</td>
</tr>
<tr>
<td></td>
<td>PER2</td>
<td>0.840***</td>
<td>39.278</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER3</td>
<td>0.830***</td>
<td>35.774</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER4</td>
<td>0.849***</td>
<td>31.348</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER5</td>
<td>0.890***</td>
<td>31.013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER6</td>
<td>0.855***</td>
<td>23.439</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER7</td>
<td>0.872***</td>
<td>30.355</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PER8</td>
<td>0.831***</td>
<td>23.987</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>PER9</td>
<td>0.850***</td>
<td>27.239</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>PER10</td>
<td>0.866***</td>
<td>29.058</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$S\text{-}BX^2 (df = 149) = 505.856$; $p < 0.000$; $NFI = 0.895$; $NNFI = 0.912$; $CFI = 0.923$; $RMSEA = 0.078$

* = Parameters fixed to this value in the identification process
*** = $p < 0.01$
Table 1 presents the results obtained from the CFA that indicate that the theoretical model on CSR has good fit ($S - BX^2 = 505.856; df = 149; p = 0.000; NFI = 0.895; NNFI = 0.912; CFI = 0.923; RMSEA = 0.078$), all items from the related factors are significant ($p < 0.01$), the size of all standardized factor loads exceed 0.60 (Bagozzi & Yi, 1988), Cronbach's and CFI have a greater value of 0.70, and extracted variance index (EVI) has a value greater than 0.50 (Fornell & Larcker, 1981). Therefore, these values indicate that there is sufficient evidence of reliability and convergent validity that justifies internal reliability of the scale used (Nunally & Bernstein, 1994; Hair et al., 1995).

In relation to discriminant validity of the intellectual property and innovation theoretical model, evidence is provided in two ways, which is presented in table 2. First of all, it presents the interval of confidence test proposed by Anderson and Gerbing (1988) that establishes confidentiality range of 95% none of the individual elements from the latent factors correlation matrix has value of 1.0. Secondly, arises the extracted variance test proposed by Fornell and Larcker (1981), which establish that the extracted variance between each pair of constructs is higher than their corresponding EVI. Therefore, according to the results obtained from both tests it is possible to conclude that both measurements present sufficient evidence of discriminant validity of the theoretical model.

Table 2. Discriminant Validity of the Theoretical Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Products Innovation</th>
<th>Processes Innovation</th>
<th>Business Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Products Innovation</td>
<td>0.783</td>
<td>0.182</td>
<td>0.089</td>
</tr>
<tr>
<td>Processes Innovation</td>
<td>0.267 – 0.587</td>
<td>0.858</td>
<td>0.092</td>
</tr>
<tr>
<td>Business Performance</td>
<td>0.159 – 0.439</td>
<td>0.169 – 0.449</td>
<td>0.727</td>
</tr>
</tbody>
</table>

The diagonal represents the Extracted Variance Index (EVI) while above diagonal the variance part is shown. Below diagonal is the correlation estimation of factors with a confidence interval of 95%.

**Results**

In order to answer the hypotheses stated in relation to the theoretical model of intellectual property and innovation, a model of structural equations was applied, using EQS 6.1 software with same variables used in the AFC (Bentler, 2005; Byrne, 2006; Brown, 2006), which examined the nomological validity of the theoretical model through the test of the Chi Squared Test, which consists on comparing results obtained between the theoretical model and the measurement model, where results indicate that differences between models are not significant, which allows to define an explanation about the relationships between the latent constructs (Anderson & Gerbing, 1988; Hatcher, 1994). Table 3 shows these results in detail.

Table 3. Results of The Structural Equations Model

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Structural relationship</th>
<th>Standardized coefficient</th>
<th>Robust t value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H1:</strong> The higher level of products innovation, the higher the level of business performance.</td>
<td>In. Product $\rightarrow$ B. Performance</td>
<td>0.246**</td>
<td>3.991</td>
</tr>
<tr>
<td><strong>H2:</strong> The higher level of processes innovation, the higher the level of business performance.</td>
<td>In. Processes$\rightarrow$ B. Performance</td>
<td>0.208**</td>
<td>3.434</td>
</tr>
</tbody>
</table>

$S - BX^2 (df = 149) = 505.740; p < 0.000; NFI = 0.895; NNFI = 0.912; CFI = 0.923; RMSEA = 0.078$

**$ = P < 0.05$
Table 3 presents results of the structural equation model application, and in regards to hypothesis H1, $\beta = 0.246, p < 0.05$, which indicate that products innovation has significant and positive effects on the business performance, in SMEs from Aguascalientes region in Mexico. In terms of H2, the results present the following results, $\beta = 0.208, p < 0.05$, defining that processes innovation has positive and significant effect on business performance in SMEs. Therefore, it is possible to conclude that products and processes innovation are good predictors of businesses performance.

**Discussion**

These results show an important change in SMEs management because these represent a new management mainly if the company search for a significant increment in its level of performance, it has to adopt and implement products and processes innovation, as an elemental and basic strategy, if not it will be difficult to achieve its goals. In consequence, manufacturing SMEs managers should do the necessary changes inside their companies in order to gain that products innovation as well as processes innovation are implemented in all areas or departments of the company.

At the same time, both products and processes innovation are equally important to achieve greater levels of business economical performance in manufacturing SMEs, for which managers will have to generate better organizational environment that support and impulse a working change from employees and workers of the organization. Furthermore, the work environment has to change to be adapted to an entrepreneurship culture, by which workers develop their team activities and can propose an alternative solution to the existing SMEs problem.

On the other hand, it is important to discuss about the main limitations that have this empirical research. The first limitation is the use of scales to measure both type of innovations and business performance, because only 5 items were considered to measure products innovation, 4 items to measure processes innovation and 10 items to measure business performance; for this reason future research it would be necessary to incorporate alternative items or factors to corroborate the results obtained in this research.

A second limitation is the collection of information because only qualitative variables were considered to measure product and processes innovation and business performance, for this reason in future research it would be convenient to incorporate quantitative variables to corroborate these present results.

A third limitation is related to the applied surveys, only managers and owners of manufacturing SMEs, for which the results obtained can differ if it is applied on a different population, for this reason it would be necessary to apply surveys with both customers and suppliers, to corroborate results obtained.

A fourth limitation, is that only manufacturing SMEs in Aguascalientes region in Mexico with only 5 to 250 employees were considered. It would be necessary to consider businesses with less than 5 employees, more because this represent more than 60% of the population. Last limitation is that the majority of manufacturing SMEs considered that requested information in surveys was confidential therefore results here presented could not necessary be organizations reality.

Finally, it is important to go beyond results obtained in this empirical research and to discuss deeper: what effect would manufacturing SMEs have when using quantitative scales to measure products and processes innovation and business performance? What results in terms of performance SMEs would have if another model was used to measure products and processes innovation? What other specific activities of products and processes innovation would have higher impact on business performance in manufacturing SMEs? These and other questions can be raised and answered in future research.
Conclusions

Considering the results obtained in this empirical research, it is possible to conclude two main aspects. First, all activities related to products innovation that manufacturing SMEs adopt and implement could generate a higher level of business performance. For this reason, if organizations want to significantly improve its economical or financial performance then these would have to adopt and implement initially all innovation activities that are orientated to create changes or improvements to existing products in the company. Mainly because it may provide economical and financial resources that are necessary to the development of new products or to adjust processes to requirements and needs of both clients and customers.

Second, the adoption and implementation of products innovation are not only required for manufacturing SMEs are in conditions to significantly improve its level of business performance, but also require the implementation of processes innovation initiatives, because are actually the processes what allows changes and improvements for innovative products. Therefore, companies not only have to orientate innovation to production processes but to all management processes because it will facilitate innovation activities in manufacturing SMEs and these will have a greater effect on the level of business performance.

In this sense, both products and processes innovation are essential activities that manufacturing SMEs have to adopt or implement, because it will allow them to get higher levels of business performance. However, companies have to focus on developing together, because products innovation require processes inovation, so new products could be designed, produced, commercialized in a different manner than how the organization was used to. Additionally, through these two main activities, manufacturing SMEs will have more possibilities to significantly increment business performance and to generate economical and financial resources to carry out products and processes innovation activities.

References


