

Barriers to Innovation and Performance: The Mexican SMEs Context

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Abstract: The twenty first century is recognized for its high economy globalization, competitiveness and uncertainty in the business environment, where essentially Small and Medium-Sized Enterprises (SMEs) have to constantly adapt strategies to remain in market. Innovation is considered in the literature as a strategy that allows firms to keep them in market position and to enhance its performance level. However, SMEs have a number of barriers that prevent innovation activities, basically because these enterprises generally make few investments on research and development. This paper presents an analysis of innovation in SMEs performance, operating in Aguascalientes state, México, using a sample of 400 companies. The results obtained show how barriers to innovation significantly affect SMEs performance levels.

Key words: barriers to innovation; performance; small and medium-sized enterprises **JEL codes:** M10

1. Introduction

Business environment is increasingly becoming uncertain, complex and unpredictable (Coopers & Lybrand, 1997), where technology, knowledge, competitiveness and innovation have critical roles in business performance (Hadjimanolis, 1999; Scott, 2000; Hitt et al., 2001; O'Regan et al., 2005; van Auken et al., 2008). For that reason, in the majority of countries there is an increasing establishment of politics focusing on firms enhancement, especially for Small and Medium Enterprises (SMEs), because commonly this sector demonstrates high potential on innovation activities and can quickly adapt their resources to respond business environment and society demands (Castells, 2010; Huang & Tsai, 2011; Klewitz & Hansen, 2011; Demirbas et al., 2011).

Those actions revamp the creation of an appropriate environment for business development and generate essential support to develop activities related to business innovation, growth and performance (Lynskey & Yonekura, 2002; Alberti et al., 2008), that is a reason why innovation is widely recognized by various researchers, academics and professionals in the field of management, and considered critical variable with great impact on business performance and economy growth (Dunning, 1993; Hay & Kamshad, 1994; Griffith et al., 2009). In fact, Stopford (2001) defines that this kind of necessary changes are the main reason why various businesses are currently looking for new strategies that can lead them to better performance.

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In this sense, Barnett and Hansen (1996) determine that the innovation level in enterprises, compared to competitors, is essential to achieve better performance. At the same time, innovation is necessary to widen life cycle of products and to take advantage of new market opportunities (Pisano & Wheelwright, 1995; Bakema et al., 2002; O'Regan et al., 2005). However, to implement an innovation process is complex, especially in SMEs, because these organisations have limitations in term of financial, human and technological resources (Hadjimanolis, 1999), which do not allow them to eliminate barriers to innovation processes, especially to develop new products and services (Larsen & Lewis, 2007).

For this study, a model from Quinn and Rohrbaugh(1983) was selected to measure SMEs performance, it proposes four dimensions of organizational effectiveness: human relationships, internal processes, open systems and rational processes. Similarly, studies from Geroski and Machin (1992), Moore (1995), Regev (1998), Heunks (1998), Verona (1999), Hughes (2001), Hsueh and Tu (2004), Van Auken et al. (2008) and Madrid-Guijarro et al. (2009) provide empirical evidence about the relationship between barriers to innovation and SMEs performance.

Finally, in accordance to the recommendations made by Demirbas, Hussain and Matlay (2011) incrementing analysis and discussion on barriers to innovation in SMEs, the principal contribution of this research is a contribution of empirical evidence about the existing relationship between barriers to innovation and SMEs performance in a country under development, such as México. The second contribution of this paper is the methodology used, by using structural equations to test the established hypotheses in the theoretical model.

This paper is presented in the following order. Section two presents the literature review and previous related work, along with the establishment of hypothesis. Third section shows the research methodology. Fourth section explains the results obtained. And finally on fifth section the main conclusions and discussions are provided.

2. Literature Review

Literature regarding barriers to innovation in SMEs is relatively new and it is not expanding, although, recently some studies have been published about this topic there are classifications of barriers impeding business performance. In this regard, Cooney and O'Connor (1996) and Keegan et al. (1997) found a great variety of barriers to innovation in European SMEs, and concluded that many of these barriers are specific to a particular country and others are common among developed countries and emergent countries. Furthermore, these investigations have considered that barriers to innovation are more common among majority of European countries and include: socioeconomic, politics and cultural influences, legal considerations, feasible products imitation, market size and lack of governmental support.

Correspondingly, frequent barriers to innovation, in firms operating in developed countries and in emergent economies, include high costs associated to innovation activities, lack of working capital, high taxes, high social security costs, preference of high security levels in big companies, which in contrast, those in SMEs include, preference to hire graduated personnel with high skills and a low return of investment from research projects and development that organizations implement (Cooney & O'Connor, 1996; Keegan et al., 1997). However, there are typical barriers to innovation that any country face, which include the lack of support and growing strategy by government authorities at all levels, which at high percentages difficult growing and development of SMEs (Teece, 1996).

Usually, a regular classification from the literature is that establishing the difference between barriers to external innovation (called exogenous,) and internal barriers (named endogenous) (Piatier, 1984; Hadjimanolis,

1999; Madrid-Guijarro et al., 2009). This way, Piatier (1984) establishes a clear difference between external barriers that impede innovation in organizations, including, demand, supply and environment, and internal barriers that make complex a good organizational management, as resources availability and change resistance from employees. Therefore, government activities have strong influence in creating barriers to innovation that impede SME surveillance, by also negatively affecting innovation on production processes, as well as, supply and business exports (Rush & Bessant, 1992).

Similar results were established by various theoretical and empirical studies carried out at a national and international levels, such as the study case by Acs and Audretch (1990), studyingAmerican firms, another carried out by Ylinenpää (1998) made in Sweden, and Hadjimanolis (1999) who study firms in Cyprus. Moreover, comparative studies among different countries, for example, those carried out by Mohnen and Rosa (2002), Baldwin and Lin (2002) and Baldwin and Gellatly (2004). Hadjimanolis (1999) determines that external barriers are those related to financial resources, technical information availability and selection of appropriate teams for business development. Whereas internal barriers represent all those related to barriers to business like barriers to personnel.

Additionally, there are studies published in the literature that analyse and discuss barriers to innovation in a specific to a sector of the economy, for instance, the case of service and manufacturing sectors in the economy of Canada (FES, 2004). Mohnen and Röller (2005) carefully compare barriers to innovation in Ireland, Denmark, Germany and Italy presenting interesting results. Besides, Galia and Legros (2004) present a similar study about barriers to innovation in manufacturing enterprises in the region of Valencia in Spain. Nonetheless, Freel (2005) define barriers to innovation in manufacturing SMEs on the West Midland, UK, which alike to those in previous studies.

On the other hand, firms established in under-development countries or with an emergent economy, such as Mexico, have specific characteristics and barriers to innovation, for example, lack of technology and an inappropriate size of the company to respond market demands (Lall, 1983; Levy, 1993). Moreover, government in this kind of countries is commonly pressured by power groups to adopt progressive politics that reduce efforts for SMEs to improve and therefore, generate serious barriers to innovation, with a socioeconomically, cultural and environmental complexity that in the end have negative impacts on SMEs competitiveness and innovation levels (Kumar & Sagip, 1996; Evanson & Johnson, 1998; Johnson et al., 2000; Glas et al., 2000; Pissarides et al., 2000; Woodword, 2001; Anderson et al., 2001).

Furthermore, recent literature present analysis of barriers to innovation on SMEs, for example a case study by Segarra-Blasco et al. (2008) and Madrid-Guijarro et al. (2009), who identify a number of politics impeding innovation activities. Segarra-Blasco et al. (2008) analysed manufacturing SMEs and intensive knowledge services, in Spain, and defined several external barriers to innovation that negatively impact managers skills to identify, to evaluate and to access relevant information given by technology, institutions funding and employees skills.

However, Madrid-Guijarro et al. (2009) explain barriers to innovation, in greater detail, by analysing 294 Spanish SMEs, comparing the existing relationship among products innovation, processes and management systems; and identify 15 barriers to innovation that impede SMEs skills to improve profit and competitive levels. Besides, these authors concluded that barriers to individual innovation have different impact levels on the singular types of innovation, specifically studied on their research. In fact, they identify barriers to innovation more significant were associated to costs accumulation and to change resistance derived from innovation.

At the same time, Madrid-Guijarro et al. (2009) define that barriers to innovation can be conceptualized following three categories: financial resources, external environment and human resources, which are directly related to SMEs performance. In general, in the literature there are some studies suggesting SMEs as not innovative (Davidsson, 1989; Hakim, 1989; Storey, 1994), it is also true that there are SMEs having serious barriers to innovation, in both categories, national and international firms (Griffith et al., 2009; Nieto & Santamaria, 2009). Therefore, it would be advantageous to discuss and analyse this topicin order to contribute in the understanding of its nature.

2.1 Financial Resources

SMEs difficulties to access financial resources have been considered as main barrier to surveillance, innovation and performance (Tidd et al., 1997; Larsen & Lewis, 2007). To promote SMEs investment on innovation, Freel (2000) suggests that government has to play a special role while their corresponding agencies offer financial support to develop mechanisms to introduce innovation processes in SMEs. Meanwhile, banks have to reconsider their SMEs no financial characteristics and better promote technology and products development in markets as an alternative to ensure funding. However, it is important to consider that various financial agents perceive innovation funding as a high risk capital (Hall, 1990) and it is a reason why diverse SMEs do not consider bank capitals to implement their innovation strategies (Larsen & Lewis, 2007).

H1: Less financial risk has a significant positive effect on business performance

2.2 External Environment

There are a great deal of factors impacting SMEs external environment, among the most important include, economy turbulence and the lack of firms cooperation, markets information and government support. This situation can be solved if companies efficiently communicate to managers about the importance of innovation, as a critical strategy that allows enhancement of performance (Frishammar & Hörte, 2005). Likewise, Khan and Manopichetwattana (1989), Souitaris (2001) and Katila and Shane (2005) define a positive relationship between external economical uncertainty and SMEs performance.

H2: Less external uncertainty has a significant positive effect on performance

2.3 Human Resources

There are various studies that analyse human resources as an important barrier to innovation. For example, Kane et al. (1999) identify three essential factors that represent barriers to innovation. First, the low priority level given to human resources by managers, as generally they are perceived as power and control. In this sense, human resources have less power and poor status in front of high-level executives (Torrington, 1989; Gennard & Kelly, 1995; Kane, 1996; Grant & Oswick, 1998). Second, human resources professionals do not have the necessary skills and knowledge to implement continuous improvement at the human resources area inside the organisation. Thus, human resources professionals have to take a more proactive role in the companies (Collins, 1985; O'Neill, 1985; Dyer & Holder, 1988; Schuler, 1990; Miller, 1991; Moore & Jennings, 1993). Third, the lack of workers training that represents barrier affecting innovation and SMEs performance in the long term (Guest & Peccei, 1994; Fernie & Metcalf, 1995; Legge, 1995; Storey, 1995; Huselid, 1998).

H3: Less deficiency on human resources have a significant positive effect on firm performance

3. Methodology

An empirical research was carried out in SMEs, operating in Aguascalientes state, México, in order to

validate the established hypotheses. The first research phase depicted a qualitative study through a business panel, where various managers from government organisations linked to SMEs participated, along with financial institutions managers and SMEs managers. They provided own insights and perceptions, so it was possible to evaluate the data collection instrument. The obtained results in this first phase allowed better understanding of the situation in this specific sector and information provided was useful for the qualitative phase.

The procedure followed to design a reference framework was to obtain information from the Firms Directory in the Firms Information System in México (SIEM from its acronym in Spanish), specifically in Aguascalientes state, México, resulting a total of 8,661 firms. For this study, firms from 5 to 250 workers were only considered, so the sample was reduced to 1,342 businesses. The original sample was 500 firms, which was constructed by random sampling with maximum error of $\pm 4\%$ and a confidence level of 96%. Equally, the survey was designed to be completed by SMEs managers and applied through personal interviews from September to December 2008; obtaining 80% response rate, which represents a total of 400 surveys completed.

Barriers to innovation were measured through 16 variables and grouped in the following three factors: financial resources, human resources and external environment (Madrid-Guijarro et al., 2009). Managers were asked to evaluate the importance of difficulties presented on the survey, using a Likert 5 scale, with limits 1 as not important and 5 as very important. These variables were used to measure barriers to innovation, because various studies have considered that the managers' attitude has a significant impact on innovation (West & Anderson, 1996; Lefebvre et al., 1997; Storey, 2000; Madrid-Guijarro et al., 2009).

In terms of performance measurement, managers answered about its firm competitive position, using 12 variables and a Likert 5 scale, where 1 = poor performance level shown during the last two years and 5 = high performance level shown during the last two years. Literature presents various studies using these variables to measure SMEs performance (Quinn & Rohrbaugh, 1983; Walton & Dawson, 2001; Frankel et al., 2001; Brockman & Morgan, 2003; Miron et al., 2004; van Auken et al., 2008).

A Confirmatory Factor Analysis (CFA) using the method of maximum likelihood estimation in EQS 6.1 (Bentler, 2005; Brown, 2006; Byrne, 2006) was used to evaluate reliability and validity of the presented measurement scales at the same time, reliability of measurement scales was evaluated through Alpha Cronbach and Composite Reliability Index (CRI) (Bagozzi & Yi, 1988). All scales values exceed the recommend value 0.7, for Alpha Cronbach; thus, it provided reliability evidence and justified internal reliability of the scales (Nunally & Bernstein, 1994; Hair et al., 1995). Adjustments to the model were the Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Confirmatory Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) (Bentler & Bonnet, 1980; Byrne, 1989; Bentler, 1990; Hair et al., 1995; Chau, 1997; Heck, 1998). Values of those indexes NFI, NNFI and CFI resulted between 0.8 and 0.89, which represent reasonable adjustments (Segars & Grover, 1993) and a value equal or superior to 0.9 provided evidence of good adjustment too (Jöreskog & Sörbom, 1986; Byrne, 1989; Papke-Shields et al., 2002). The RMSEA values lower than 0.08 are acceptable (Jöreskog & Sörbom, 1986; Hair et al., 1995).

AFC results are shown in Table 1 and suggest that the model presents appropriate data adjustment (*S*- $BX^2 = 291.973$; df = 98; p = 0.000; NFI = 0.887; NNFI = 0.903; CFI = 0.921; and RMSEA = 0.071). As evidence of convergent reliability the AFC results indicate that all factors items related are significant (p < 0.01), the size of all factorial standardized loads are higher than 0.6 (Bagozzi & Yi, 1988), alpha Cronbach and IFC are higher than 0.7 suggested by Nunnally and Bernstein (1994), and the Extracted Variance Index (EVI) from each pair of constructs are higher of 0.5 in all cases (Fornell & Larcker, 1981).

Variable	Indicator	Factorial Load	Robust t-Value	Cronbach's Alpha	IFC	IVE
	FR1	0.673***	1.000 ^a			0.643
Financial Resources	FR2	0.779***	13.987	0.835	0.842	
	FR3	0.933***	15.676			
	EE2	0.814***	1.000 ^a			0.515
External Environment	EE3	0.614***	10.018	0.752	0.759	
	EE6	0.712***	14.208			
	HR3	0.796***	11.601		0.877	0.705
Human Resources	HR4	0.907***	18.860	0.876		
	HR5	0.812***	15.593			
	PE3	0.722***	1.000 ^a		0.891	0.541
	PE4	0.730***	15.150			
	PE5	0.758***	16.500			
Performance	PE6	0.783***	17.008	0.891		
	PE7	0.714***	14.577			
	PE8	0.709***	13.121			
	PE10	0.725***	16.797			
$S-BX^2$ (df = 98) = 29.973; p	< 0.000; NFI =	0.887; NNFI = 0.9	03; CFI = 0.921; RM	MSEA = 0.071		
^a = Parameters constricted t	o that value in t	he identification pro	ocess.			
*** = p< 0.01						

 Table 1
 Internal Consistence and Convergent Validity Evidence of the Theoretical Model

Evidence of discriminant validity is provided by two measurements that are presented on Table 2. First, through an interval of 95% reliability, where none of the individual elements from the latent factors in the correlations matrix has value 1.0 (Anderson & Gerbing, 1988). Second, the extracted variance on each pair of constructs resulted higher than its corresponding EVI (Fornell & Larcker, 1981). In base of this criteria, it is possible to define that from various measurements this study presents sufficient evidence of reliability and convergent and discriminant validity.

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Variables	Financial Resources	External Environmental	Human Resources	Performance		
Financial Resources	0.643	0.253	0.162	0.021		
External Environment	0.377-0.629	0.515	0.473	0.019		
Human Resources	0.283-0.523	0.542-0.834	0.705	0.019		
Performance	0.082-0.210	0.068-0.208	0.068-0.212	0.540		
The diagonal represents the Extracted Variance Rate (IVE), while above the diagonal the part of the variance is shown (the correlation to the table). Under the diagonal, the estimation of the correlation of the factors is shown with an interval of 95%.						

 Table 2
 Discriminant Validity Measuring of the Theoretical Model

4. Results

The conceptual model was analysed using the Structural Equations Model (SEM) using the EQS 6.1 software (Bentler, 2005; Byrne, 2006; Brown, 2006). In order to obtain the statistical results from the research hypothesis, a SEM was created with same variables in order to corroborate the model structure and to obtain results, which

allow contrasting established hypotheses. Nomological validity of the theoretical model was analysed through the Chi square test, in which the theoretical model was contrasted to the model measurement. Results indicate that non-significant differences in the model are good explanations about the observed relationships among latent constructs (Anderson & Gerbing, 1988; Hatcher, 1994). The results from this analysis are presented in Table 3.

Hypothesis	Structural Relation	Standardized Coefficient	Robust t-Value		
H₁: Lower level of financial risk, higher level of performance.	Financial R. \rightarrow Performance	0.204**	2.769		
H₂: Lower level of external environmental, higher level of performance.	External E. \rightarrow Performance	0.141**	2.549		
H₃: Lower level of human resources deficiencies, higher level of performance.	Human R. \rightarrow Performance	0.104**	2.912		
<i>S-BX</i> ² (df = 217) = 291.505; p < 0.000; NFI = 0.885; NNFI = 0.903; CFI = 0.921; RMSEA = 0.044					

	Table 3	Structural	Equation	Modeling	Results fro	m the	Theoretical	Mode
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*** = P < 0.01

Regarding first hypothesis \mathbf{H}_1 , as shown in Table 3, the results ($\beta = 0.204$, p < 0.05) indicate that financial resources have significant and positive effect on SMEs performance. Whereas, in relation to second hypothesis \mathbf{H}_2 , the obtained results ($\beta = 0.141$, p < 0.05), demonstrate that the external environment has positive significant impact on performance. Results obtained ($\beta = 0.104$, p < 0.05), concerning hypothesis \mathbf{H}_3 , indicate that human resources have a positive and significant effect on SMEs performance. Thus, it is possible to corroborate that barriers to innovation have positive significant effects on SMEs performance, especially those in Aguascalientes, México. Therefore, it is possible to confirm that financial, environmental and human resources barriers have positive effects on performance, which allows to conclude that if SMEs aim to increment its performance then firstly, these have to eliminate these three barriers to innovation.

5. Conclusions and Discussion

If we consider innovation as any change or improvement to products, processes or management systems, it would be risky to assure that any SME making changes on any of these factors would be the most innovative and higher performance firm. On the contrary, what we can assure is that in base on these presented results, SMEs making changes to innovation processes are in a best position to obtain greater performance levels. Furthermore, performance and innovation are two factors leading firms to higher competitiveness levels. If SMEs do not implement innovation processes its competitive position will be seriously affected along with its performance level. Instead, SMEs implementing innovation in products, processes and management systems will improve its competitiveness and performance levels in a significant manner.

This paper provides results that can be used by firms aiming better understanding of the relationship between innovation and performance. Additionally, performance is a key factor in any firm hence SMEs managers' perception of innovation and barriers that impede innovation activities and business performance will be critical to design and implement competitive strategies. However, managers that do not have clear understanding of the innovation foundation and relevance and its definition as a survival and growing strategy, the firm's competitive position will be at risk, which in consequence will be as well its competitiveness and performance levels.

At the same time, managers have different perceptions about the root causes of innovation barriers to SMEs performance. From the results of this empirical study using a sample of 400 SMEs operating in Aguascalientes,

México, it is possible to determine that financial resources are the main barrier to innovation and therefore to SMEs performance. Thus, results are congruent with those defined in previous studies, specifically by Sivades and Dwyer (2000), Frenkel (2003), Bergemann (2005), Hausman (2005), van Auken et al. (2008) and Madrid-Guijarro et al. (2009).

Moreover, this paper results can be of great interest for the public administration field, because government politics directed to increase innovation investments should include better performance, sustainable economical and employability growth. In this sense, public administration should play a key role for SMEs in order to overcome innovation barriers, facilitating information related to market opportunities, technology changes and providing financial support, so Mexican SMEs enhance innovation activities and performance levels. At the same time, the public politics and government supports focused on SMEs should stimulate innovation and performance in this type of firms (Madrid-Guijarro et al., 2009).

To finish, this study results can be also useful for consultants and organizations that provide services to SMEs. A clear comprehension of the innovation relevance as a resource for better SMEs performance will allow consultants and organizations to design and apply strategies for better SMEs competitive advantages. However, this study has various limitations, which can be solved in future research. For example, the imparity of this sector and deep concentration of SMEs in Aguascalientes capital, bias results. Another limitation of this study is the data collection, because only a small part of innovation and performance activities was used. Besides, data collection was during a specific period; it was not a longitudinal study, so it was not possible to gather information to evaluate changes carried out by SMEs at any time or space. Therefore, future research should include information that allows an examination of the relationship between innovation and performance, at both short and long terms.

Due to the interest given to this topic, it is important to remark that the majority of firms of the used sample have considered information provided as confidential and private, for which data collected may not reflect real information about the enterprise. In spite of this, other elements to measure innovation, such as investments on research and development can be desirable to increment validity of results in future studies. Furthermore, as the survey was only applied on SMEs in Aguascalientes state, the results may no be generalized to all SMEs in México. Therefore, it is important to research further technical results and discuss the research questions, such as, what type of firms have more innovation barriers and poor performance? What innovation activities are more important for SMEs? These questions can be answered in future research.

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