Innovation, Information Technology and Performance:
The Iberoamerican SMEs Context

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Abstract:
Innovation is considered in the current literature as an important topic and key variable to improve both use and adoption of information and communication technologies, as well as, to achieve better business performance levels in Small and Medium Enterprises (SMEs). At the same time, an appropriate alignment of innovation activities with the use of information technologies helps businesses to improve their levels of performance. Furthermore, the purpose of this paper is to present an empirical research that examines the current relationship among innovation, information and communication technologies, and SMEs performance. For this, a sample of 1,989 enterprises was obtained from 21 countries in Iberoamerica. The results have demonstrated that innovation has a positive and significant relationship on both information and communication technologies and SMEs performance.

Keywords: Innovation, information technology, performance, SMEs.

Topic of the Workshop: Universities, Innovation, and Entrepreneurship

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1. Introduction
The twenty first century is recognized for, among other elements, its high uncertainty in all types of organizations, mainly in small and medium-sized enterprises (SMEs), which are called to develop innovation activities and to increasingly use information and communication technologies (ICTs), also, to not only achieve major levels of performance but to remain in the market (Mohsin, Bashir & Latif, 2013). In consequence, companies are improving their business strategies to obtain or increase their business performance levels in such turbulent environment, in which innovation and ICTs are considered critical elements that provide to businesses, especially to SMEs, sustainable competitive advantages (Nonaka & Takeuchi, 1985).

Furthermore, there are relatively few published theoretical and empirical studies that correlate innovation, ICTs and firm performance (Johannessen, Olaisen & Olsen, 1999; Sambamurthy, Bharadwaj & Grover, 2003), and even fewer studies that correlate these three constructs into a SMEs context (Xiang & Lan, 2001; Larsen & Lomi, 2002; Izushi, 2003; Tanabe & Watanabe, 2005). In particular, Cooper (1998) was one of the pioneer researchers who considered that the existing advances on computing technology, software costs reductions and technology advances that offer better opportunities to increase innovation activities, not only were available for large firms but also for SMEs.

In this sense, according to Dibrell, Davis and Craig (2008), Franquesa and Brandyberry (2009) there is a need for more research about these three variables, therefore the present study present two main contributions. The first one is to provide a research on these three constructs together, because published research has only considered innovation in products, processes and systems in a separate form, so in this paper it is presented an analysis that defines in a more precise approach the effects of innovation on ICTs, and business performance, as recommended by Vermeulen (2005), Olson, Slater and Hult (2005) and Wolff and Pett (2006). The second contribution is that this research is carried out associating SMEs an approach that has not been done before, only in few studies so far (Huang & Liu, 2005), instead most published research related to these constructs it has commonly been focused on large firms contexts.

2. Literature Review
A robust analysis of the current literature in the field of innovation has permitted to assure that innovation activities can be divided into two special areas of research (Brown & Eisenhardt, 1998). First, it is possible to analyse and discuss innovation into a national, industrial, and firms context (O’Neill, Pouder & Buchholtz, 1998), in which innovation can be defined as a group of practices in technology, strategies and business management that organizations apply as daily activities, in comparison with those used by other companies that have been previously adopted and implemented, or that have been significantly redesigned and improved in a certain process (O’Neill et al., 1998).

Second, innovation can be analysed by its influence on business structure, strategic processes, and customers and consumers, through marketing and new products development (Zahra, 1993; Dibrell & Craig, 2006). In which innovation can be defined as new products, processes and management systems created by businesses to adapt themselves to market requirements (Damanpour, 1991). Hence, innovation activities carried out by organizations, especially SMEs, can be understood through several essential dimensions: radical, incremental, products, processes, managerial and technological (Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Cipres & Boronat-Navarro, 2004).
Accordingly, the three most common dimensions of innovation found in the literature are products, processes and management systems (Daft, 2001). Innovation creates products or services, and innovations in management systems show changes or improvements in the organization management (Camisón-Zornoza et al., 2004). Therefore, innovation in products, processes and management system represent potential developments and can provide resources to gain higher performance levels and competitive advantages (Dibrell et al., 2008).

On the other hand, when firms, particularly SMEs, consider the use and adoption of ICTs as a competitive advantage, these not only increase innovation, but also they are able to implement strategic plans to significantly improve performance and competitiveness in their business (Dibrell & Miller, 2002; Oh & Pinsonneault, 2007; Aral & Weill, 2007). Ergo, during the recent years, organizations have significantly increased investments on ICTs (Devaraj & Kohli, 2003), this way the use and adoption of ICTs by SMEs are increased, and development of the necessary business skills are accelerated in order to obtain higher performance levels and competitive advantages (Kohli & Devaraj, 2003; Ravichandran & Lertwongsatien, 2005).

Consequently, SMEs performance can be notably better when there is a synergy between innovation and ICTs (Dibrell et al., 2008), because companies that have adopted and used ICTs further show an increment of their operative elements compared to those that have not (Huang & Liu, 2005). Accordingly, investment on ICTs not only stimulates productivity and performance in SMEs, but significantly increase both innovation and profits in short time (Johannessen et al., 1999).

In such case, in order to enable SMEs to develop their capacity for innovation in a sustainable manner and to incorporate innovation activities in their organization strategies they will need all resources available so they can develop innovation on products, processes and management systems. Therefore, they can be able to solve their creativity issues; and to connect innovations with ICTs and business performance (Bhaskaran, 2006). This is because ICTs are critical elements to develop innovation activities (King & Burgess, 2006). Hence, business performance can systematically improve if SMEs increase innovation activities complemented with ICTs initiatives, since it will also amplify customers’ loyalty and raise products and services demand (Frishammar & Hörte, 2005).

At the same time, SMEs that require to exhibit higher responsibility levels and to make flexible products, processes and management systems must correctly coordinate their capabilities to make them efficient and to improve internal and external competencies (Tanabe & Watanbe, 2005; Zahra, Neubaum & Larrafeta, 2007). Such efforts have to remain for long periods of time from adoption and implementation of ICTs, so they can obtain the desired, essential and fundamental results for business operations (Dibrell et al., 2008), this is mainly because both innovation activities and ICTs improve SMEs performance and such activities need to be incorporated into the strategic level of this type of organizations (Dewett & Jones, 2001).

In this sense, various researchers, academics and professionals in organizational and computing sciences have defined that innovation activities present a direct impact on ICTs and vice versa these have a direct impact on SMEs performance (Dibrell et al., 2008). Further, Lee and Runge (2001) have defined in their study on SMEs that companies are more innovative when they are prone to successfully adopt and use ICTs than those less innovative. Additionally, those innovative firms devote additional economical and financial resources for acquisition and enhancement of ICTs than those less innovative. Therefore, considering the previous information, it is feasible to establish the first hypothesis as follows:
**H1: There is a positive relationship between innovation and ICTs usage**

Even though the majority of innovations are carried out by SMEs, which represent the greatest number of companies operating in territories on any country (SBA, 2004), most of the empirical research published in the literature has been focused on innovation inside large companies (Gudmundson, Tower & Hartman, 2003; Verhees & Meulenberg, 2004). Furthermore, in the literature it is an increased recognition for SMEs to be the source of most of the innovations activities, in products, processes and management systems (Freel, 2003), so it is possible to consider innovation activities in SMEs to be totally different from those initiated in big firms (Eden, Levitas & Martinez, 1997; Audretsch, 2001).

In this way, SMEs cannot only identify, in a more efficient and fast way, market alternatives that require more innovation in products and services but also to significantly improve relationships with customers and final customers, and to improve firm’s performance compared to large companies (Dibrell et al., 2008). Moreover, Brown and Blackmon (2005) consider in their study that SMEs can easily combine production flexibility with a specialization of products and services, which create tailored products and services for customers and consumers, while obtaining a higher level of business performance. Thus, considering this information it is possible to establish the following second hypothesis:

**H2: Higher level of innovation, higher level of business performance**

On the other hand, publications of empirical research that demonstrate innovation processes requiring ICTs usage, as a key element to generate higher performance level have been ignored in the literature (Bharadwaj, 2000; Dewett & Jones, 2001). Thus, more empirical research publications are necessary in order to provide evidence about the existing relationship between ICTs and business performance, specifically in a SMEs context (Verbees & Meulenberg, 2004; Huang & Liu, 2005). Thus, it is important to consider SMEs because these types of companies have a close relationship with the use and adoption of ICT, which is relevant to its analysis and discussion (Dibrell et al., 2008).

In fact, Khazanchi (2005) highlights the need to incorporate and to analyse alternative variables in organizations when considering the existing relationship between the use and adoption of ICT and business performance, for instance, innovation. Hence, Khazanchi (2005) has concluded that ICTs has a positive effect on SMEs performance when other variables have been considered such as innovation activities. Accordingly, when organizations, basically SMEs, consider innovation in their organization strategies, the adoption and use of ICTs demonstrate more positive and significant effects on performance. This way, in consideration of the previous information it is feasible to present a third research hypothesis in this paper, as follows:

**H3: There is a positive relationship between ICTs usage and business performance**

### 3. Methodology

An empirical study was carried out in order to corroborate the established hypotheses, specifically in 1,989 SMEs surveyed from 21 countries in Iberoamerica. The survey was organized in three sections. The first section presents the innovation activities (products, processes and management systems) reported by SMES during the last two years. The second section is related to ICTs and the third section is about business performance. Companies considered were those with 5 to 250 workers. It was a telephone survey using random sample of SMEs; surveys were applied from August and December 2011.

#### 3.1. Dependent Variables
To measure current level of ICTs usage, managers and owners from the 1,989 Iberoamerica SMEs were asked to respond if their firms have (1 = yes and 0 = no) the following elements:

1. Does your company have email?
2. Does your company have Web?
3. Does your company buy and sell by the Internet?
4. Does your company use electronic banking?
5. Does your company market using Internet?
6. Does your company have corporative Internet?

From the answers obtained it was possible to create a ICTs variable, by adding all affirmative responses. Therefore, having a nominal variable with values from 0 to 6. Such variable configuration can be seen from Garcia (2007) and Garcia, Martinez, Maldonado et al. (2009) studies.

In order to measure current business performance, eight questions were used and measured with a Likert 5 rating scale, with limits 1= totally disagree and 5= totally agree, and adapted from Garcia (2007). Table 1 demonstrates such questions in great detail.

### Table 1. Questions used to measure performance

<table>
<thead>
<tr>
<th>In comparison to key competitors, the company:</th>
<th>Totally disagree</th>
<th>Totally Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Offers products with better quality</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. Has more efficient internal processes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Achieves customer satisfaction</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Adapts itself to market changes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Is growing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. Is more profitable</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Has satisfied and motivated employees</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Presents less work absenteeism</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

3.2. **Independent and Control Variable**

To measure current innovation activities, managers from 1,989 Iberoamerica SMEs were asked innovations have been developed in their organisations during the past two years before this survey (1= Yes and 2= No); especially innovations on products/services, processes and management systems. The companies that answered yes were asked to define an importance level of such innovations, from one as less important to five as very important. This is because a subjective approach from a managerial perspective about innovation results to be the most appropriate method for SMEs studies (Hughes, 2001; Garcia et al., 2009). Table 2 presents a list of questions used in the survey to measure innovation activities.

### Table 2. Questions used to measure current Innovation activities

<table>
<thead>
<tr>
<th>Have you made any change or improvement in your products, processes o management systems during the past two years? In case of a positive answer indicate the importance level of such changes</th>
<th>Importance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less Important</td>
</tr>
<tr>
<td>Products/services</td>
<td></td>
</tr>
<tr>
<td>-Changes or improvements in existing products/services</td>
<td>No □</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>-Commercialization of new products/services</td>
<td>No □</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
**Proces**
- Changes or improvements in production processes
- Acquisition of new equipment goods

**Management Systems**
- Direction and management
- Purchases and stocking
- Commercial/Sales

<table>
<thead>
<tr>
<th>Process</th>
<th>No □</th>
<th>Yes □</th>
<th>1 2 3 4 5</th>
<th>No □</th>
<th>Yes □</th>
<th>1 2 3 4 5</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes or improvements in production processes</td>
<td>No □</td>
<td>Yes □</td>
<td>1 2 3 4 5</td>
<td>No □</td>
<td>Yes □</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Acquisition of new equipment goods</td>
<td>No □</td>
<td>Yes □</td>
<td>1 2 3 4 5</td>
<td>No □</td>
<td>Yes □</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

**Management Systems**
- Direction and management
- Purchases and stocking
- Commercial/Sales

**Size.** This variable was measured by averaging number of employees in the company, in 2009.

**Age.** It was measured by adding operating years of the firm, from opening the company until survey application date.

### 4. Results

To study the existing relationships among innovation, ICTs and SMEs performance and the hypotheses established, a linear regression was used by the OLS (Ordinary Least Squares) based the following models:

**Model 1:**

\[
\text{Performance}_i = b_0 + b_1 \cdot \text{Innovation}_i + b_2 \cdot \text{ICTs}_i + b_3 \cdot \text{Size} + b_4 \cdot \text{Age} + \varepsilon_i
\]

**Model 2:**

\[
\text{ICTs}_i = b_0 + b_1 \cdot \text{Innovation}_i + b_2 \cdot \text{Size} + b_3 \cdot \text{Age} + \varepsilon_i
\]

Where, **Performance**, indicates the average level of agreement from the eight variables used to measure performance. **Innovation**, denotes the importance level of innovation in products/services, processes and management systems. **ICTs**, represents the level of ICT usage in the business. **Size**, shows the average number of employees in the firm, and **Age**, defines the company’s life. Two models were estimated for both variables performance and ICTs.

**Table 3. Relationship among Innovation, ICTs and Performance (n = 1989)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>ICTs</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation</td>
<td>0.199***</td>
<td>0.274***</td>
</tr>
<tr>
<td></td>
<td>(9.234)</td>
<td>(12.660)</td>
</tr>
<tr>
<td>Size</td>
<td>0.219***</td>
<td>0.112***</td>
</tr>
<tr>
<td></td>
<td>(9.818)</td>
<td>(5.034)</td>
</tr>
<tr>
<td>Age</td>
<td>0.019</td>
<td>0.062***</td>
</tr>
<tr>
<td></td>
<td>(0.870)</td>
<td>(2.825)</td>
</tr>
<tr>
<td>Higher VIF</td>
<td>1.093</td>
<td>1.093</td>
</tr>
<tr>
<td>F value</td>
<td>73.787**</td>
<td>71.047***</td>
</tr>
<tr>
<td>R^2 adjusted</td>
<td>0.099</td>
<td>0.096</td>
</tr>
</tbody>
</table>

Below every standardized factor, in parenthesis, t-student value

* = p ≤ 0.1; ** = p ≤ 0.05; *** = p ≤ 0.01

Table 3 indicates the innovation level with positive and significant relationship with ICTs in SMEs (β = 0.199 and p < 0.01), by which the first research hypothesis is confirmed. Additionally, the age of SMEs impacts in a positive and significant manner ICTs (β = 0.219 and p < 0.01). However, the variable age does not affect the use of
ICTs in SMEs, because there is no significant statistical variable. The model validity is contrasted through the adjusted $R^2 = 0.099$ and F value = 73.787 ($p < 0.01$). Moreover, the independent variables have a Variance Inflation Factor (VIF) near 1, VIF= 1.093, which suggests no multicollinearity problems.

Furthermore, Table 3 illustrates how innovation has a positive and significant relationship with SMEs performance ($\beta = 0.274$ and $p < 0.01$), whereby the second hypothesis is also confirmed in this empirical study. On the other hand, the size and age also have a positive and significant effect on firms performance ($\beta = 0.112$ and $p < 0.01$, $\beta = 0.062$ and $p < 0.01$, correspondingly), however, in minor level compared to the innovation variable. Likewise, the model validity is achieved by the $R^2$ adjusted (0.096) and F value = 71.047 and $p < 0.01$. Finally, it was found that the VIF from independent variables has a value near 1, specifically 1.093, thus multicollinearity was not considered a statistical problem in this study.

### Table 4. Relationship between ICTs and Performance (n = 1989)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICTs</td>
<td>0.128***</td>
</tr>
<tr>
<td></td>
<td>(5.634)</td>
</tr>
<tr>
<td>Size</td>
<td>0.126***</td>
</tr>
<tr>
<td></td>
<td>(5.390)</td>
</tr>
<tr>
<td>Age</td>
<td>0.058***</td>
</tr>
<tr>
<td></td>
<td>(2.564)</td>
</tr>
<tr>
<td>Higher VIF</td>
<td>1.066</td>
</tr>
<tr>
<td>F value</td>
<td>27.148***</td>
</tr>
<tr>
<td>R² adjusted</td>
<td>0.038</td>
</tr>
</tbody>
</table>

Below every standardized factor, in parenthesis, t-student value

\* = $p \leq 0.1$; \*\* = $p \leq 0.05$; \*\*\* = $p \leq 0.01$

In relation to the existing relationship between ICTs and performance, Table 4 shows that a greater use of ICTs positively and significantly impacts SMEs performance ($\beta = 0.128$ and $p < 0.01$), which confirms the third research hypothesis. At the same time, both size and age variables affect in a positive and significant manner SMEs performance ($\beta = 0.126$ and $p < 0.01$, $\beta = 0.058$ and $p < 0.01$, respectively) although in a lower degree compared to ICTs. Validity of the model is contrasted to the adjusted $R^2$ square = 0.038 and F value equal to 27.148 ($p < 0.01$). Independent variables present a Variance Inflation Factor (VIF) near 1 (1.066). Therefore, multicollinearity is not a problem in this regression model.

### 5. Conclusion and Discussion

In conclusion, there are two main implications derived from the results obtained in this empirical research. First, given innovation has a positive and significant relationship with ICTs and SMEs performance, it is possible to conclude that managers and companies owners must incorporate innovation in their products, processes and management systems, and not only as a critical element in their organization strategies, but as part of their daily activities. This is mainly because accordingly to the level of
implementation and usage of innovation activities in organizations an increment will be also obtained in the adoption and usage of ICTs, and economical and financial performance, in Iberoamerica SMEs.

Second, by integrating innovation operations in SMEs as part of their daily activities, managers will additionally need to adopt and increment the use of ICTs, mainly because this type of technology accelerates enhancement of firm performance. If the firm has already incorporated this type of tools, then it will not only need to renew such tools but will also need to implement a continuous training system for their personnel that manage these technologies. In a way that it improves effectiveness and efficiency both internally and externally the organization, because basically it will permit Iberoamerica SMEs to significantly increase not only their performance level but also their competitiveness.

Furthermore, an important part of innovation that is conceived at a global level is generated by SMEs, and Iberoamerica SMEs are not recognized for being innovative, instead for being familiar, which in consequence most of the managers are the firm owners, and they are who carry out most of the direction activities. Therefore, it is essential to managers an adequate implementation of an innovative organizational culture, in which a suitable environment results necessary for employees and workers so they can develop ideas, innovative work and teamwork and at the same time be acknowledged by all workers in the organization.

At the same time, adoption, efficient and effective use of ICTs must play a critical role in Iberoamerica SMEs, for which managers have to honour their application and not only in innovation activities developed by the firm but also in all organizational activities that will let businesses improving their performance level. Similarly, SMEs must develop new actions in which ICTs in businesses are better employed. For example, products or services commercialization through the Internet, raw material purchase by Internet and the use of Internet banking or the implementation of telework, for some of their employees and workers.

Additionally, this paper presents various limitations that are important to consider. Firstly, the scale used to measure innovation, because three dimensions were considered and in future research it will be useful to incorporate alternative scales in order to corroborate present results. Secondly, the gathering of information, because there was only used a small part of information about innovation, ICTS, performance mainly through qualitative data. Thus, in future research it will be necessary to integrate quantitative variables to corroborate if same results can be obtained.

Thirdly, a limitation related to the measurement innovation, ICTs and performance, because seven items were only used to measure innovation, six for ICTs and eight items to measure business performance. Thus, in future research it will be useful to include more and alternative items in order to measure constructs. A fourth limitation is that the surveys were applied only to SMEs managers and/or owners, then the results obtained can vary if these were used in a different population, for instance, incorporating clients and costumers in the survey. Hence, alternative populations should be considered in future research in order to validate current results.

The last limitation is that only Iberoamerica SMEs having 5 to 250 workers were considered. Therefore, in future research it will be necessary to study firms with less than 5 workers, which in fact represent more than 60% of the country population. Finally, a deeper analysis and discussion will be pertinent, for example studying: what will be the effects on SMEs performance if a more quantitative scale was used to measure innovation? What results can be obtained for ICTs in SMEs if other
dimensions were used to measure innovation? These and other possible unanswered questions along with future research perspectives can be studied.

References


