

INNOVATION IN SMES: WHO? WHAT KIND? WITH WHAT EFFECTS?  
PRELIMINARY RESULTS OF AN EXPLORATORY STUDY

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**ABSTRACT**

The importance of innovation for firm growth and survival has been well discussed in the entrepreneurship and innovation literature. We studied the factors that are either helping or hindering innovation in small and medium firms especially those related to the lead innovator in SMEs, the entrepreneur, the opportunity at the origin of the venture, the industry in which the firm competes, and strategies used by the entrepreneur. Results indicate that an entrepreneur's education level and entrepreneurial experience are positively related to firm innovation whereas an entrepreneur's industry experience is marginally negatively related to firm innovation. Stronger positive relations are also observed between firm innovation and the entrepreneur's creative personality and growth and perenniality motivations whereas an entrepreneur's autonomy motivation is negatively related to firm innovation. The entrepreneur's subjective value of the opportunity at the origin of the venture is also positively related to firm innovation. Firm innovation is positively related to firm growth, especially management and product innovation. However, we observe that different types of innovations have an effect on firm growth according to the industries in which firms compete. Finally, we observe that there is a U-shaped curvilinear relation between the degree of innovation in SMEs and the innovation productivity in terms of firm growth.

**INTRODUCTION**

Innovation is seen by many actors in society as an important component of a firm's growth and survival and regional and national economic growth. Indeed, several researchers have looked at the relations between innovation and performance or growth and its beneficial impact on the competitive advantage of small firms (Hult et al., 2004, Verhees and Meulenbergh, 2004, for instance). Other researchers have looked at the factors and determinants promoting innovation or at the barriers preventing innovation in SMEs (Bhattacharyya and Bloch, 2004; Gudmundson et al., 2003, Huergo and Jaumandreu, 2004, Kickul and Walters, 2002, McAdam et al., 2004, among others). We will now review some of the findings from these authors.

**REVIEW OF LITERATURE**

Gudmundson et al. looked at the impact of the types of ownership and customers served and organizational culture on innovation in small firms. They found out that innovation was

positively related to the level of management support and empowerment of workers in the organizational culture. In addition, family firms, by creating a more supportive organizational culture, initiated and implemented more innovations than non-family firms. Finally, only partial support was found for the relation between the types of customers served and innovation: non-family firms selling to businesses were more innovative than family firms selling to businesses or non-family firms selling to consumers.

In a similar note, McAdam et al. found that firms in the manufacturing, construction, transport, storage and communication sectors in peripheral locations were hampered by a certain lack of vision for the future and organizational culture not conducive to innovation.

Huergo and Jaumandreu wanted to explore the changing probability of innovation with firm age in Spanish firms. Their results show the probability of innovation to be rather stable over time, varying considerably across industries, and increasing monotonically with size. Thus, newer firms seem to innovate more than older firms and larger firms seem to innovate more than smaller firms. As small size is clearly associated by itself with less innovation, it therefore seems clear that small entering firms must be regarded as having extra capabilities which outweigh the size handicap. They also noted that exit from the market appears to be associated with relatively poor pre-exit innovative performance, mainly in process innovation. Also the oldest firms in industry tend to show lower probabilities of introducing innovations, especially in product innovations.

Bhattacharyya and Bloch also explored the effect of firm size on innovation. They observed that innovative activity increases significantly with firm size, but at a decreasing rate. Firm growth is insignificant in inducing subsequent innovation and R&D intensity is significantly positive in influencing successive innovation. In the high-tech industries, innovation increases significantly with firm size, but at a decreasing rate. In the low-tech industries, innovation also increases significantly with firm size, but its effect decreases at a slower rate than in high-tech industries.

Finally, in their study of internet firms, Kickul and Walters observed that the relations between opportunities and new ideas and e-commerce innovations were moderated by the entrepreneur's proactive aspects in his personality. Indeed, proactive entrepreneurs were more likely to introduce new product/service offerings and build e-commerce solutions/applications to satisfy the needs of both the organization as well as their customers. The authors also found that many of the proactive entrepreneurs developed and implemented innovative internal business relationships or management innovations.

On the relations between innovation and firm performance, Hult et al. observed positive correlations between firm performance and innovativeness and entrepreneurial orientation in the firm. Verhees and Meulenbergh also found positive relations between innovativeness and firm performance.

In short, several factors have an impact on firm innovation: firm age, firm size, industry, type of ownership, type of customers served, organizational culture, and the proactive elements of the entrepreneur's personality.

## **RESEARCH QUESTIONS AND METHODOLOGY**

As we have seen, Kickul and Walters observed a relation between innovation and the proactive aspects of the entrepreneur's personality. In addition, Huergo and Jaumandreu alluded that small entering firms must be regarded as having extra capabilities which outweigh their size handicap in innovation. We propose that these small firms' "extra capabilities" are in fact related to the motivations and creativity aspects of the entrepreneur's personality.

One of the authors, in earlier studies (Baronet, 2001 and Baronet, 2003), had looked at the personality characteristics of entrepreneurs, especially creativity and motivations for growth, autonomy and perennality, and their impact on discovery of opportunities, strategies entrepreneurs engaged in, and firm growth. It seems natural that we continue this line of inquiry in studying the relations that might exist between an entrepreneur's characteristics and innovation activity in his firm. Indeed, we consider here the entrepreneur as the lead innovator in the firm he has created to exploit an opportunity.

### **Research questions**

Therefore, in this paper, we examine the impact of the entrepreneur's demographic and personality characteristics as well as other firm and industry elements on the innovation practices of 348 US and Canadian SMEs in different industrial sectors. The questions we try to answer are:

- Do an entrepreneur's industry experience, education level, entrepreneurial experience, and the fact he created the business alone or with an entrepreneurial team have an impact on the degree on innovation in his firm?
- Do an entrepreneur's creative personality and motivations for growth, autonomy, and perennality have an impact on the degree on innovation in his firm?
- Does the subjective value of the opportunity (Baronet, 2004 and Baronet, 2005) at the origin of the venture have an impact on the degree on innovation in the firm?
- Do the strategies the entrepreneur might engage in, such as export and differentiation marketing strategy, have an impact on the degree on innovation in the firm?
- Does the level of innovation activity in the firm have an impact on firm growth?
- What kinds on innovation activities have an impact on firm growth?

### **Methodology**

Since this was an exploratory research, we asked students to interview entrepreneurs for a class project and have them answer our questionnaire. The questionnaire included personality tests covering the entrepreneur's orientation, creativity and motivations, demographic characteristics, and a quantitative description of the firm and its strategies. It also included a 25-item scale of innovation practices (Cronbach alpha of .906). Those 25 items were reduced to five factors related to five types of innovation: management, marketing, partnerships and financing, process, and product innovation (Cronbach alphas for each sub-scale were between .707 and .862).

The general level of innovation in the firm and the levels for the five sub-scales of innovation were the dependent variables in the first part of this study. The entrepreneur's demographic and personality characteristics, the subjective value of the opportunity, the industry in which the firm operates, and the strategies of export and differentiation were the independent variables.

In the second part of the study, the general level of innovation and the five types of innovation were the independent variables and firm growth in sales the dependent variable.

The final sample showed good variability, covering different industrial sectors, a range of firms that have been in business for 3 to 35 years, a range of growth in sales and number of employees, different strategies used, etc. We eliminated partial non-respondents, firms where the entrepreneur founder was no longer present, and firms with less than 5 years and more than 25 years of operations. The median number of employees for the final sample was 15 and the median sales were 2.5 millions dollars.

## **RESULTS**

Table 1 illustrates the results from the multiple regression analysis we conducted on the general level of innovation in the firm and the five sub-scales.

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Table 1 about here

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### **Demographics of the entrepreneur**

Of the four demographic characteristics we looked at, the education level is the only one that is significantly and consistently related to innovation, either at the general level or within all the sub-scales except process innovation. Industry experience has a significant negative impact on product innovation whereas the entrepreneurial team has a significant positive impact on product innovation. Finally, entrepreneurial experience has a significant positive impact on process and product innovation.

### **Personality of the entrepreneur**

An entrepreneur's creative personality and growth motivation have a significant and consistent positive impact on firm innovation, either at the general level or within all the sub-scales. In fact, they have the strongest impact of all the variables on innovation in almost all the different types of innovation. Perenniality motivation has a significant positive impact on management and process innovation and autonomy motivation has a significant negative impact on product innovation.

### **Opportunity**

In earlier works (Baronet, 2004 and 2005), the subjective value of an opportunity was defined as a combination of perception of knowledge asymmetry favoring the entrepreneur and entrepreneurial risk. This value has a significant impact on general innovation and marketing and partnerships innovation.

### **Industry**

We can observe some significant positive impact of the manufacturing industry on process innovation and some significant negative impact of the service and retail industries on the partnerships and product innovation.

### **Strategies**

Export activity seems to have a marginal significant positive impact on innovation. A differentiation strategy has a significant positive impact on innovation, especially management and marketing innovation.

### **Innovation and growth**

Table 2 shows the results of the multiple regression analysis we performed on firm growth using the types of innovation as independent variables. We ran into a problem of collinearity on marketing innovation with one of our sub-samples, firms in the retail sector. We therefore dropped marketing innovation from the analysis to ensure good quality of the analysis.

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Table 2 about here

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We can observe the significant positive impact of management and product innovation on firm growth for the total sample. In the manufacturing and service sectors, only management innovation has a significant positive impact on growth. We also observe a significant positive impact on firm growth of product innovation in the technology sector and of partnerships innovation in the retail sector. Finally, in the agriculture sector, process and product innovations have a significant positive impact on firm growth.

### **Serendipitous findings**

By chance, we also looked at the productivity of innovation activities in terms of the growth produced by innovation. Without embarking on a full analysis of this new variable, including taking into accounts other elements generating growth in the firms we studied, we were able to discern a few findings.

First, innovation productivity differs from one industry to the next. Thus, for one additional degree of innovation, firms in the technology sector will be able to get on average 1.71% additional annual growth, whereas firms in the agriculture sector will be able to get only 0.26% additional annual growth, firms in the retail sector 0.56%, firms in the service sector 0.70%, and firms in manufacturing 1.04%.

Second, we also found that there is a U-shaped curvilinear relation between the degree of innovation and productivity of innovation. Productivity of innovation for our sample appears to be stronger at the low end and the high end of the curve, according to the following equation:

$\text{Log of Innov.Productivity} = 0.5968 - (0.03 * \text{DegreeInnov}) + (0.0003 * \text{DegreeInnov}^2)$ .

## **DISCUSSION**

It seems clear that our findings put forward the importance of the entrepreneur, as a creative individual, in the innovation activity of the firm. Indeed, as we saw, the personality characteristics of the entrepreneur have the largest impact on firm innovation among all the variables studied. This remains so even as the firm ages and becomes larger and for all types of innovations. We could thus propose that as long as the entrepreneur is present in a managerial capacity the firm will be as innovative as he is creative.

It is also clear that innovation in all its forms has an impact on firm growth. This impact will differ from one industrial sector to the next but it will be present. Indeed, it is hard to imagine that a firm can grow without any innovation. Here we have yet another confirmation of the impact of innovation on growth.

For those of us whose role it is to assist entrepreneurial activity and by extension economic growth in regions or nations, the creative personality scale used in this study might be a useful tool. To be sure, if growth is related to innovation and firm innovation to entrepreneurial creativity, knowing how creative the main innovator in a firm (the entrepreneur) is, will be useful in predicting the level of innovation a firm can expect to reach. If an entrepreneur is perceived as "not creative enough", maybe some outside help might be offered to compensate for this lack of creativity. Also, considering the impact of different types of innovation on firm growth according to the industrial sectors where they operate, we could thus offer useful advice as to the best types of innovation in which one might invest for better results.

The serendipitous finding of a curvilinear relation between the degree of innovation and innovation productivity opens up possible further studies as to why this happens. A brief overview of the results on this finding shows that this curvilinear relation gets stronger as a firm has been in operation for longer time and weaker as a firm grows in size. Perhaps, we need to study the learning curve of innovation in firms to better interpret this curvilinear relation.

### **Limitations**

Probably the main limit of our study is situated in the small sub-samples we have for some industrial sectors, namely retail and agriculture. This limits the significance of our findings. Even though the statistical analysis appears to show a significant relation, further study with larger samples in these industries is necessary to really predict an impact of certain types of innovations on growth within these industries.

### **CONCLUSION**

We set out to observe if a set of variables, but mainly the personal characteristics of an entrepreneur, had an impact on the level of innovation in his firm. The results of our study do show such an impact. In fact, the entrepreneur's personality, defined as a combination of creativity and motivation for growth, is the most important element of all the factors favoring or hindering firm innovation.

We also wanted to verify the impact of innovation on firm growth. Again our results indicate that such an impact exists. We were also able to qualify this impact in terms of the types of innovation having an impact according to the industry in which firms compete.

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Table 1: Standardized regression coefficients for types of innovation

	Dependent variable: Total innov.	Dependent variable: Management innov.	Dependent variable: Marketing innov.	Dependent variable: Partnerships innov.	Dependent variable: Process innov.	Dependent variable: Product innov.
Industry experience (log)	-.056	-.013	-.047	.004	-.027	<b>-.128**</b>
Education level	<b>.138***</b>	<b>.111**</b>	<b>.110**</b>	<b>.172****</b>	.062	<b>.123**</b>
#Entrepreneurial experience	.069	.029	.043	.011	<b>.107**</b>	<b>.086*</b>
#Team start venture	.031	.040	-.019	.052	-.003	<b>.089*</b>
Creative personality	<b>.198****</b>	<b>.165****</b>	<b>.219****</b>	<b>.108**</b>	<b>.087*</b>	<b>.203****</b>
Growth motivation	<b>.276****</b>	<b>.230****</b>	<b>.189****</b>	<b>.376****</b>	<b>.124**</b>	<b>.165****</b>
Autonomy motivation	-.058	-.071	-.039	.039	-.032	<b>-.103**</b>
Perenniality motivation	<b>.129***</b>	<b>.204****</b>	.014	.034	<b>.174****</b>	.048
Value of opportunity	<b>.114**</b>	.070	<b>.153***</b>	<b>.127***</b>	.059	.038
#Manufacturing	<b>.128*</b>	.111	-.070	.017	<b>.351****</b>	.084
#Service	-.107	-.061	-.003	<b>-.181**</b>	-.070	<b>-.186**</b>
#Retail	<b>-.133***</b>	-.064	-.074	<b>-.131**</b>	-.132**	<b>-.167***</b>
#Agriculture	-.006	.020	-.003	<b>.133***</b>	.042	<b>-.163****</b>
#Export activity	<b>.093*</b>	.020	.013	.032	.043	.048
#Differentiation strategy	<b>.153****</b>	<b>.205****</b>	<b>.163***</b>	.080	.063	.074

Adjusted

R<sup>2</sup> .457 .304 .244 .363 .337 .341

F 19.27\*\*\*\* 10.47\*\*\*\* 8.01\*\*\*\* 12.82\*\*\*\* 12.03\*\*\*\* 12.19\*\*\*\*

\* p ≤ .10; \*\* p ≤ .05; \*\*\* p ≤ .01; \*\*\*\* p ≤ .0001

# denotes a dummy variable

Table 2: Standardized regression coefficients for growth

	Dep. Var.: Growth All industries	Dep. Var.: Growth Manufact- uring	Dep. Var.: Growth Service	Dep. Var.: Growth Technol- ogy	Dep. Var.: Growth Retail	Dep. Var.: Growth Agriculture
Management innovation	<b>.300</b>	<b>.265</b>	<b>.420</b>	.135	.474	.163
Partnerships innovation	.069	.122	-.026	-.047	<b>.519</b>	.096
Process innovation	-.042	-.052	.050	.055	-.181	<b>.398</b>
Product innovation	<b>.256</b>	.111	.062	<b>.476</b>	-.199	<b>.344</b>
Adjusted R <sup>2</sup>	.254	.086	.209	.228	.611	.566
F	29.28****	3.08**	11.80****	3.15**	9.26****	9.79****

Significant betas are in bold characters.

\*\*  $p \leq .05$ ; \*\*\*\*  $p \leq .001$