

# **Innovation Commercialisation and Anticipated Return: A Typology of Innovative SMEs**

**Thuy Hang Do**

*University of St Gallen, Switzerland*

**Tim Mazzarol**

*University of Western Australia*

**Thierry Volery**

*University of St Gallen, Switzerland*

**Sophie Reboud**

*Burgundy School of Business, Groupe Esc Dijon Bourgogne, France*

## **SUMMARY**

This study presents a typology of innovative small to medium size enterprises (SMEs) based on their anticipated returns to an investment in the commercialisation of an innovation. A large multi-country sample was surveyed in relation to the process of commercialisation. A discriminant analysis identified four distinct groups based on their anticipated returns from the innovation, and how systematic they were in their process of commercialisation. The findings suggest that differences exist between firms in relation to age, size, R&D intensity, preference for project financing, treatment of intellectual property and the novelty of the innovation. Younger firms were more likely to have higher anticipated innovation returns, but a less systematic commercialisation processes. Adolescent firms were more systematic and more optimistic over returns. However, as firms matured and increased in size their commercialisation process became more systematic, but their anticipated returns more subdued. Older firms were both unsystematic and anticipating low returns.

**Keywords:** innovation management; rent; commercialisation; SMEs.

Corresponding author:

Thuy Hang Do, [thuyhang.do@unisg.ch](mailto:thuyhang.do@unisg.ch)

Paper presented at the International Council for Small Business (ICSB) World Conference 2012 “Leading from the Edge”, Wellington New Zealand 10-13 June, 2012.

## INTRODUCTION

Innovation has been recognized as a key driver of economic growth and performance enhancer for business during the past sixty years (Sweezey 1943; Brozen 1951; Ames 1961). Although small to medium sized enterprises (SMEs) have been the subject of several studies, research on their innovation management and commercialisation is still scarce (Hoffman et al, 1998). Tidd (2001) noticed lack of clear and coherent conceptual foundations to assist managers in managing innovations. Adams, Bessant and Phelps (2006) suggested that exist many confusing and contradictory approaches to innovation management and they developed a framework for its measurements.

Past research into the behaviour of innovative SMEs has generated a range of taxonomy (Pavitt and Townsend 1989; Rizzoni 1991; Archibugi 2001; Dirk et al. 2010). These studies have offered valuable insights into the factors influencing innovative SMEs as they relate to success or weakness, sectoral patterns, types of innovations, strategies, organizational structures (Pavitt 1989; Rizzoni 1991) or business models (Dirk et al. 2010). However, scant research has investigated the typology of SMEs innovators along the dimensions of the firm's anticipated innovation rent and its commercialisation processes. SMEs are often characterized by limited resources to develop innovation and commercialisation (Mazzarol and Reboud 2011). Therefore, a systematic approach to innovation management is likely to have a positive influence on the firm's ability to generate potentially valuable returns to investment in such innovation (Mazzarol and Reboud 2011). However, many SMEs have little formality in their approach to innovation management adopting a more intuitive approach, relying on local market knowledge and creativity (Lindman 2002).

As investments into innovation often involve uncertainty, it is essential for firms to evaluate the potential risk and return before developing new innovations. Earlier studies have shown that an assessment of the potential return from an innovation investment helps to predict the success or failure of new innovations (Mansfield et al, 1977; Astebro and Michela 2005). This concern has stipulated various investigation into the determinants of the project success (Cooper 1981; Montoya-Weiss and Calantone 1994; Balachandra and Friar 1997; Henard and Szymanski 2001), key success factors for new product development (Balachandra and Friar 1997; Henard and Szymanski 2001; Lilien and Yoon 1989; Linton, Walsh, and Morabito

2002; and Montoya-Weiss and Calantone 1994) and survival of innovations (Astebro and Michela 2005).

The purpose of this paper is to investigate the relationship between the anticipated return of an innovation and its commercialisation process. This relationship will be explored by generating a typology of innovative SMEs to differentiate their behavior and characteristics in commercialisation by drawing on a sample of 525 SMEs from 10 OECD countries. We focus on key differentiating criteria such as the size, age and growth of firms, resource endowments (for example, the R&D intensity and the preferential financial channel), the novelty, the protection of intellectual properties (IP) and the major innovation types that firms developed. This study contributes to bridge the research gap in relation to the cause - effect relationships underpinning the commercialisation processes. As such, we aim to answer the following research questions:

1. What are the factors that differentiate SME innovators' anticipation of potential high rent returns to innovation from those that do not?
2. What are the factors that differentiate SME innovators in implementing systematic processes of innovation management from those that do not?
3. What are the factors that results in SME's high anticipated rent despite their unsystematic processes of innovation management?

## **THEORETICAL BACKGROUND**

### **Innovation Rent Concept**

In the context of innovation management, the concept of "rent" is associated with the anticipated financial outcome generated by the investment in an innovation. The innovation rent is defined as returns that "arise from the existence, discovery and successful commercial exploitation of entrepreneurial opportunities" and "are excess of the opportunity costs of all resources used" (Miles, Paul and Wilhite, 2003 p 394). Alvarez and Barney (2004) remarked that two of the most important activities that firms often engage in enhancing their competitive advantages are exploiting innovation opportunities and capturing an appropriate rent. The rent is often achieved under uncertain task environment due to the unknown value of these resource combinations (Schumpeter 1934; Rummelt, 1987; Mahoney and Pandian 1992; Alvarez 2007).

According to several scholars, the firm's capability in generating potential rent above the average rate of profits within its industry stems from the utilization of its competitive advantages (Porter 1985; Mahoney and Pandian 1992). The estimation of the rent indicates the firm's capacity in assessing the investment risks and its returns from the innovation. Santi et al (2003) suggested that the evaluation of the amount of innovation rent is determined by the volume of sales, the rate of margin and the duration of the innovation. The volume refers to the potential amount of sales that could be generated over one year. The rate of margin refers to the profits generated from the innovation. The duration indicates the length of time during which the innovation can be deployed. This framework for the assessment of innovation risks and returns was further improved and successfully applied by Reboud and Mazzarol (2003) in the context of SMEs.

### **Systematic Management of Innovation Commercialisation**

After having assessed the potential rent of innovations, firms have to decide whether to launch the innovation into the market. This commercialisation phase is not only associated with the market assessment but also to customers, suppliers, the nature of innovations and profitability. Herdman (1995, p 2) defined commercialisation as "the attempt to profit from innovation through the sale or use of new products, processes, and services... More than invention or innovation, commercialisation is driven by firm's expectations that they can gain a competitive advantage in the marketplace for a particular product, process, or service". According to Rosa and Rose (2007), the commercialisation process of innovation involves the interaction between firms with markets, the R&D and elements influencing the commercialisation outcomes such as financial, skills and human resources, intellectual properties, the global perspective, regulatory environment, partnering and collaboration. This outline strengthens the role of the flow of information or ideas from customers and suppliers through all stages of the commercialisation.

In reviewing innovation management measurement, Adams et al. (2006) indicated that the commercialisation process is often associated with the marketing capabilities such as market research, promotion, market planning and monitoring, because its aims are to launch the products or services into the market successfully. Moore (1991, 2002)'s work emphasized the significance of market orientation and firm's difficulties in identifying initial market segment and marketing approach to adopt in commercializing innovations. Harabi (1998) suggested

vertical relations between firms, suppliers and customers. His empirical study of the German cases showed that about 84 percent of innovators cooperated with either suppliers or customers in managing innovations, indicating a significant link among them.

Findings from various studies showed that formal planners were found to have a positive relationship with the firm's performance and enhanced the organization's effectiveness (Baker 1993; Amstrong 1982). For example, Burt's (1978) longitudinal study of Australian firms indicated that formal planners achieved higher profitability; higher return on invested capital, rates of return on total funds employed and on the absolute rate of return on invested capital in comparison with non- formal planners' performance. A more in-depth measurement of the systematic commercialisation process was described by Mazzarol and Reboud (2006). Their Innovation Diagnostic Diamond (IDD) framework comprised of the assessment from the market, resource, innovation and strategy perspectives. The four indexes were proposed to measure the firms' understanding of the market and customers' needs, the firms' capacity, the formality of product development, the protection of intellectual property and the strategies in commercializing innovations. According to this framework, the higher score indicated the firm was more systematically engaged in the process of commercialisation.

### **Effects of the Firm Size, Age and Growth**

Age, size and growth of firms have often been mentioned in literature as key factors to differentiate the innovators typology. Autio and Lumme (1998) indicated that the significant difference of innovative behavior relates to the size and growth of firms. In their study, the four types of small innovative firms comprised of application, market, technology and paradigm innovators, with the ascending level of market novelty, innovativeness and level of R&D intensity. Firm size was considered to play a more controversial role in innovation management. According to the resource- based view, the availability of having high stock of resources or inputs strengthens a firm's performance (Wenerfelt 1984; Barney 1991; Sundbo and Fuglsang 2002). Large firms were known as having an advantage in accessing financial, human, and knowledge resources, compared to small firms (Roger, 2004). In addition, Cohen and Klepper (1996) stated that there was a spread of fixed costs in managing innovation in larger firms due to the effects of economy of scale. By contrast, small firms were understood to be more flexible in managing innovation, more innovation focused, and more dynamic in recognizing opportunities (Roger, 2004).

In a recent empirical study of innovation management in Australia, France and Switzerland, Mazzarol, Volery and Reboud (2010) suggested that the size, age and firm maturity had a partial impact on the commercialisation of firms due to the change of the extent and the nature of their innovation focuses over time. The age of firms was described to have the effect of diminishing returns on innovations as mature firms were more reluctant to invest in high level of innovation novelty so as not to lower the profits deploying from their current innovations (Loderer and Waechli 2010; Dibrell, Craig and Hansen 2011; Warusawitharana 2011).

### **Effects of the Resource Endowments**

The investment into research and development (R&D) has been described as the most significant determinant of innovation in the literature (Baldwin and Hanel 2003; Becheikh et al 2006; De Jong and Vermeulen 2007). Romijn and Albaladejo (2001) remarked that the R&D as a percentage of sales correlated with the number of patents and the innovation index. In addition, Mazzarol and Reboud (2011) remarked that the R&D indicator was positively associated with the proportion of firms which generated potentially high innovation returns.

In developing innovation the firm's financial resources are often considered to be the key factor that determines its decisions in relation to a particular investment. Balwin, Gellatly and Gaudreault (2002) indicated that debts (both long and short term) and equity were the most two common forms of financing found in small innovative firms. These firms were often known as having much constraints relating to financial resources for developing innovations. Balwin et al. (2002, p. 9) concluded that "shortages of equity (retained earnings and share capital) are more important impediments to innovative activity than imperfect debt markets". Equity financing was found to be more significant in SMEs, which were high R&D intensive or undertook investments in a more uncertain task environment. With limited resources, small firms were often known to have more difficulties in obtaining loans from banks and financial markets than large firms. Hence, small firms are often found to rely more on equity markets to be more flexible in managing their innovations. On the other hand, debts or loan financing impose much more constraints on small firms due to their uncertain investments. As a result, debt-financed SMEs were found to engage more in either low- knowledge intensive industry or low R&D intensive firms (Balwin et al. 2002).

## **Effects of Innovation Novelty Level, IP Protection and Innovation Portfolio**

Findings from previous studies suggest that the launch of an innovation enhances a firm's market value and its profitability (Chaney, Devinney and Winer 1991; Blundell, Griffith, and Van Reenen 1999; Geroski, Machin, and Van Reenen 1993). In addition, the level of the novelty was found to have a positive relationship with the return on investment (Kleinschmidt and Cooper 1991). According to Chaney, Devinney and Winer (1991), original new products generate higher financial value than products which were only simply modified.

Even though the protection of intellectual property (IP) is regarded as the tool to maintain the sustainability of innovations, its contributing role remains controversial. On the one hand, Levin et al. (1987) claimed that patents, as the most common form of the IP, was found to be a key factor in protecting products and processes, in particular in pharmaceuticals and chemicals industries. According to Burrone (2005), the protection of IP has been increasingly aware within SMEs in OECD countries due to the increase of knowledge intensive sectors in the economy. Although SMEs constitute a heterogeneous group because of their varying innovative capacity and ability across sectors, size, resources and the task environment, patenting activities are perceived as an important protection tool in high technology sectors (Burrone, 2005). Santi et al (2003) also noted the protection of IP as an indicator that influence the length of the innovation exploitation.

The selection of different types of innovations as part of a specific portfolio has been found to influence the anticipated return. In this study, we draw on the definition of innovation by North and Smallbone (2000) which categorizes innovations into five types including products/ services innovations, process innovations, marketing innovations, market development innovations and administrative innovations. According to Miles, Paul and Wilhite (2003), different economic rents are created depending on the different modes of innovation. Several scholars indicated that firms which developed both products and process innovations simultaneously achieved better returns than firms which pursue separate innovations (Capon, Farley, Lehmann and Hulbert 1992; Athey and Schmutzler 1995). It is anticipated that they type of innovation will also influence the commercialisation process. For

example, a product innovation might require more a more formal process than a process innovation.

## METHODOLOGY

The analysis was conducted with a sample of 525 SMEs from 10 countries from the Organization of Economic and Cooperation Development (OECD). The countries included Australia (78 firms), Austria (78 firms), Belgium (51 firms), Canada (47 firms), France (68 firms), Italy (12 firms), New Zealand (92 firms), Spain (10 firms), Switzerland (63 firms) and United States (26 firms).

Data collection was part of an international project on innovation management in SMEs from 2006 until 2008. These firms were from a range of industry sectors, among which the manufacturing accounts for approximately 34 per cent of the total. The other major groups were services firms including retailing. The average age of firms was 22 years and the average level of investment on innovation was 23.25 per cent. In accordance with the definition of SME from the OECD (2004), all firms had less than 250 employees and an annual turnover of less than 50 million euros and they were actively engaged in the commercialisation of an innovation. Based on the definition of high and low technology firms by Hirsch-Kreinsen, Han and Jacobsen (2008), 73.5 per cent of the SMEs in our sample were high-tech firms (with R&D intensity higher than 5% of annual turnover), while 26.5 per cent were low to mid-tech firms (with below 5% of annual turnover invested into R&D).

A discriminant analysis was conducted on a typology of four groups of SMEs in terms of the size, age and growth of firms, the preference financing types, the protection of intellectual properties, the R&D intensity and the innovation novelty and the types of innovation. The typology was based on two dimensions: the potential rent and how systematic the commercialisation process was. Hence, firms in this typology were either systematic or unsystematic in the commercialisation process and were anticipating that they would capture either high or low potential rent returns.

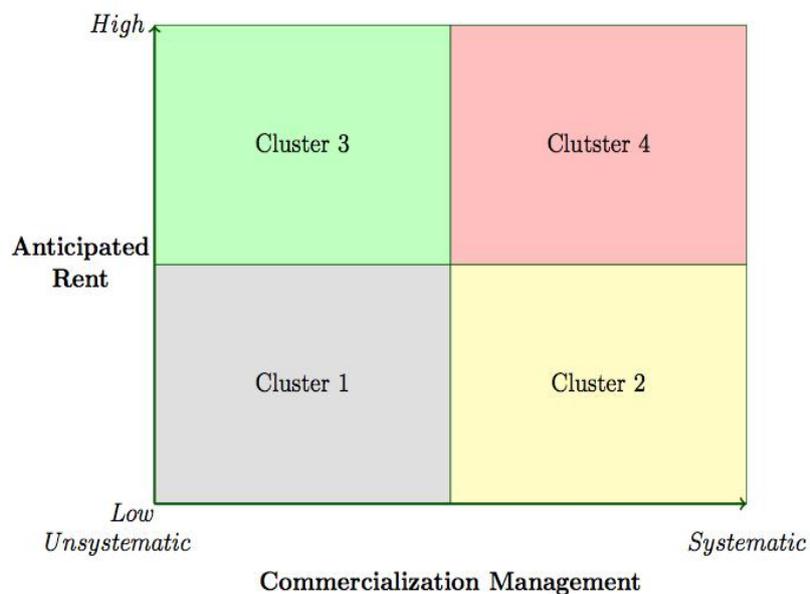
The potential innovation rent was computed as a *rent index = mean volume x mean rate x mean duration* (Santi et al. 2003). The rent index was then transformed from a scale ratio into a dummy variable, which categorized it into high or low rent.

The systematic nature of the commercialisation process was measured by the mean score of the four dimensions described by Mazzarol and Reboud (2006):

1. *Market index*—a measure of the firm's focus on customer needs and how the new innovation offers customers value for money.
2. *Innovation index*—a measure of the firm's systematic approach to the process of new product development, and its management of intellectual property.
3. *Resources index*—a measure of the firm's technological, human, financial and managerial resources.
4. *Strategy index*—a measure of the firm's strategic planning in relation to its commercialisation process.

Each index comprises a total of ten items that are scored by the owner-managers undertaking the survey. Each score ranges from 1 to 10. The firms in the data sample which obtained the score above or below average were classified into either systematic or unsystematic commercialisation group.

**Figure 1: Typology of Innovators**



The typology of SMEs innovators is illustrated in Figure 1. The first group of firms was anticipating achieving low potential rent from their innovation, while also having a largely unsystematic approach to the commercialisation process. The second group had a more systematic approach to commercialisation, but were also anticipating low rent returns. In contrast, the third group was anticipated to achieve high rent returns, although they had a largely unsystematic approach to the commercialisation process. The fourth group had a systematic approach to the commercialisation process and also anticipated a high potential rent return from their innovation.

### **Discriminating Factors**

*Firm Age:* The measure for the age of firms was based on the number of years since their establishment. The sample included firms ranging from 4 months old to 167 years old. Three groups were created in the sample based on age since establishment: young firms (less than 7 years old); adolescent firms (from 7 to 21 years old); and mature firms (more than 21 years old). The young, adolescent and mature firms accounted for 26 per cent, 40 per cent and 34 per cent of the sample respectively.

*Firm Size:* The size of firms was measured by the number of employees in the organization. The size was categorized into 3 levels including micro (fewer than 9 employees), small (from 10 to 49 employees) and medium (from 50 to 249 employees), according to the definition of SMEs by OECD (2004). In the sample, the micro, small and medium size accounted for 35 per cent, 31 per cent, and 33.5 per cent respectively.

*Firm Growth:* Three groups of firms were defined based on Mazzarol et al (2010): low growth (less than 19% growth in annual turnover); medium growth (from 19 to 46% growth in annual turnover); and high growth (more than 46% growth in annual turnover).

*Research and Development (R&D):* R&D as a percentage of annual sales or turnover indicates the level of investment in innovation. It was categorized into 5 levels ranging from 1 (bottom 20%) to 5 (top 20%) (Craig, Dibrell and Hansen 2011).

*Protection of intellectual property:* This variable was a single item with a 5 point-Likert scale to examine the importance of the intellectual property protection in commercializing the innovation.

*Financing types:* In this analysis, we considered only the financial sources that SMEs utilized for the development of innovations. The three types of financing were bank loans, retained profits and equity financing. The variables were formulated into the 5 point- Likert scale to measure how important each type of financing is to the successful innovation commercialisation of the firm.

*Innovation Novelty:* The level of innovation was based on a single item which distinguished between incremental innovation and radical innovation (Dewar and Dutton 1986). The lower level, incremental innovation measures new knowledge which is compatible with the existing products. On the other hand, radical innovations indicate revolutionary changes in technology which encompasses an absolute new design or system.

*Innovation Types:* This variable indicates the major kinds of innovation that firms developed over the last three years. Categories of innovation types were products/services, process, market development, marketing and administrative innovations.

## **EMPIRICAL FINDINGS**

The discriminant analysis models were run in the SPSS statistical software program. Wilk's Lambda statistics were used to determine the significance of the models (Wilks and Thompson, 1973). The empirical results showed that 381 cases or 73 per cent of the total firms all had valid values for this discriminant analysis. The first function of the discriminant analysis was valid with 69 per cent of the variance explained, while the second function was significant with 29 per cent of the variance explained. The rotated structure matrix indicated that the most significant correlated variables with the discriminant functions were the protection of intellectual property rights, equity financing, firm size, firm age, R&D intensity and the innovation novelty. The two other financing sources (e.g. retained profits and debt financing), and the types of innovation did not considerably influence the degree to which commercialisation was undertaken systematically, or the anticipated rent that these firms were anticipating.

The coefficients of the standardized canonical discriminant functions are presented in Table 1. Variables with high coefficients (for example, firm and protection of intellectual property) indicate a stronger discriminant effect.

**Table 1: Standardized Canonical Discriminant Function Coefficients**

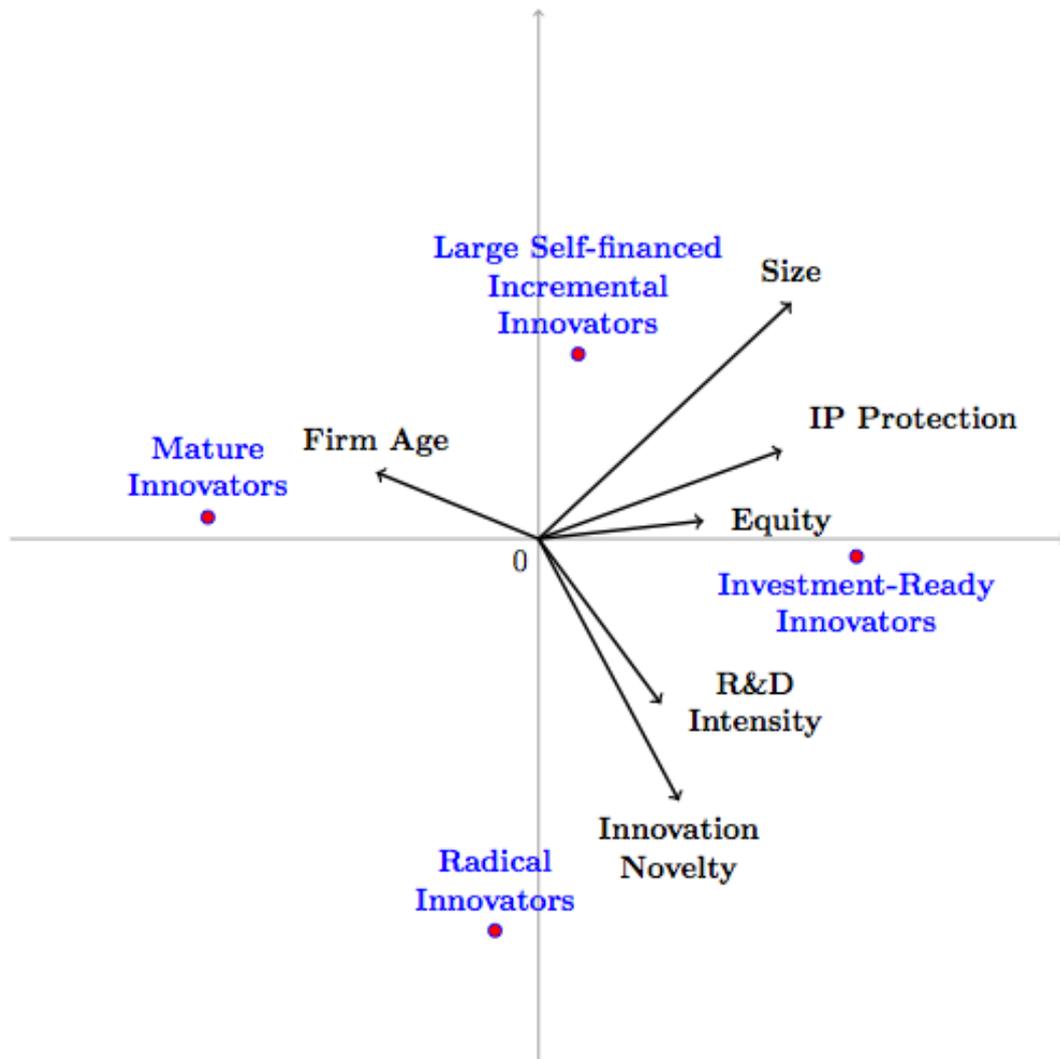
<i>Discriminant Variables</i>	<i>Function 1</i>	<i>Function 2</i>
Protection of Intellectual Property	0.553	0.201
Equity Financing	0.375	0.041
Firm Size	0.574	0.536
Innovation Novelty	0.319	-0.594
R&D Intensity	0.278	-0.374
Firm Age	-0.369	0.151
<u>Wilk's</u> Lambda	0.641	0.862
Canonical Correlation for Function	0.506	0.356
% of variance	68.6	28.8

The group centroid functions (the unstandardized canonical discriminant functions evaluated at group means) was used to plot the positions of the four clusters of firms. The plot of the discriminant analysis is illustrated in Figure 2. Each of the six discriminating variables are shown as arrows with the direction representing the coefficient scores across the two functions. The length of each arrow indicates the strength of the coefficients. Four types of firms shown in the diagram are plotted using their unstandardized canonical discriminant functions evaluated at group means (functions at group centroids). The labelling for this typology of innovators was based on the differences of firm age, size, innovation novelty, the R&D intensity, equity financing and IP.

The first cluster, which included 119 firms, was differentiated from other groups in terms of their older age, largely unsystematic commercialisation and low anticipated innovation outcome. The mean age of this group was 28 years and 4 months, accounting for the majority number of old firms in the sample. These “*mature incremental innovators*” were found to be more conservative and reluctant to invest into radical innovation. Statistical results indicated that 75 per cent of the innovations launched by these SMEs were incremental or compatible

with the existing products/services. In addition, the average investment in R&D was 16 per cent, which was lower than the average R&D of the whole sample. The number of innovations launched by these mature innovators was also limited. For example, 61 per cent of these firms launched fewer than 5 innovations over the last 3 years. Therefore, these mature firms were less active in innovation than other groups. Eighty-four per cent of these firms financed their innovations through retained profits, whereas only approximately 40 per cent of them relied on equity financing.

**Figure 2: Plot of Discriminating Factors by Innovator Typology**



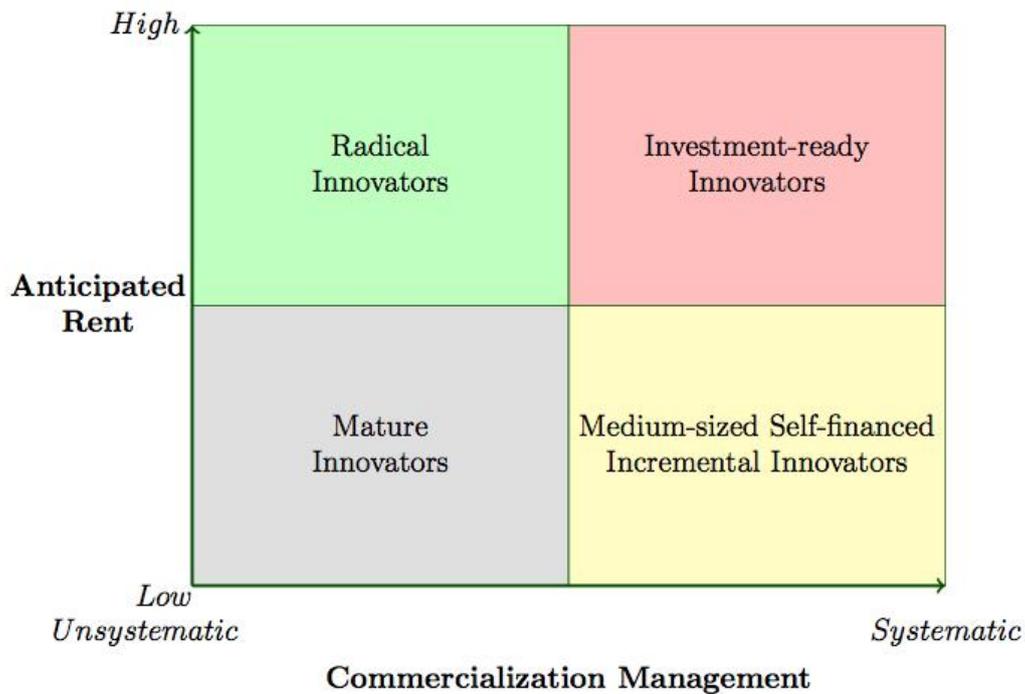
The second cluster of innovators encompassed 97 bigger-size firms, most of which were medium-sized. This cluster was labelled as “*medium-sized self-financed, incremental innovators*”. Similar to mature innovators, firms in this cluster were investing on average 16 per cent of their turnover into R&D. Among them, 71 per cent developed incremental innovations. In addition, 85 per cent of these firms used retained profits to spur innovation, indicating their high reliance on internal financing.

The third cluster comprised of 47 firms that were highly R&D intensive and focused on developing radical innovations. The average investment in the R&D was approximately 34 per cent of turnover. The vast majority of these firms (70%) were young and adolescent. Approximately half of the total successful innovations were of a radical nature, and 62 per cent of these innovations were launched to create a new market. Therefore, these firms were labelled as “*radical innovators*”.

The fourth cluster encompassed 118 firms which differentiated themselves from other clusters in terms of their preference of equity financing and their stronger focus on the IP protection. Fifty-six per cent of these SMEs relied on equity financing for developing innovations. In addition, approximately 55 per cent of them considered that the legal IP protection was a determinant of the innovation success. The majority of these firms was adolescent and invested approximately 29 per cent of annual turnover into R&D.

Based on the discriminating factors of the four clusters, the typology of innovators was mapped on the two dimensions measuring the level of the firm’s systematic management of the commercialisation process and their anticipated innovation rent. The descriptive typology of innovators is illustrated in Figure 3. It can be seen that “mature innovators” had both largely unsystematic approaches to commercialisation and low expectations of potential rent returns from their innovation. Their old age and conservative behaviour in innovation resulted in their low score in both dimensions. On the one hand, despite their systematic approach to commercialisation, “medium-sized, self-financed incremental innovators” were also anticipating to get low rent returns. That result could be explained due to their engagement into lower levels of innovation novelty and modest investment into R&D. For these firms the incremental nature of their innovation meant that above average rent returns were no longer anticipated from their already established markets.

**Figure 3: Descriptive Typology of Innovators**



By contrast, the “radical innovators” and “investment- ready innovators” were mapped in the potential high rent dimension. Despite their limited resources, these firms anticipated that they could obtain high rent returns due to their strong emphasis on radical innovation. In particular, “radical innovators” targeted a high level of innovation novelty and focused on R&D investments. This potentially enables them to anticipate a high potential outcome despite their largely unsystematic way of commercializing innovation. However, it may also reflect a somewhat naive perspective on the rent return possibilities for their innovation. On the other hand, “investment- ready innovators” were the high potentials due to their high anticipated rent and their systematic commercialisation process. These SMEs innovators were investment- ready thanks to their use of equity financing and their strong IP protection to lengthen the innovation life. This in turn strengthened their competitive advantage.

## DISCUSSION

This paper investigated differentiating characteristics of firm typologies in two dimensions: the systematic nature of the commercialisation processes and the anticipated rent return to the innovation. A typology comprising four types of firm — *mature innovators*, *large self-contained incremental innovators*, *radical innovators* and *investment ready innovators* — was developed. Findings from the discriminant analysis indicate that these four types could

be differentiated from each other in terms of the age, size, R&D as percentage of annual turnover, the novelty of the innovation adopted, the IP protection and the preference type of financing for developing innovations.

The results indicate that the size and age of firms have an impact on the anticipated innovation rent and the related commercialisation process. The age of firms resulted in the diminishing returns effects, which is consistent with previous studies (e.g. Loderer and Waechli 2010; Dibrell, Craig and Hansen 2011; Warusawitharana 2011). As bigger firms have more capacity and experience in developing innovations, as mentioned in Klepper (1996) and Roger (2004), medium-sized firms in our sample adopted a more formalized commercialisation process. However, the growth rate of SMEs did not have a considerable effect on differentiating firms in terms of their commercialisation behaviour or in anticipating the innovation rent.

The R&D proxy not only significantly differentiated high and low knowledge intensive firms, but also in terms of the anticipated innovation outcome. SMEs which spent a high proportion of their annual turnover on R&D were more innovative and more likely to anticipate that they could capture high potential rent outcomes. This conclusion is in accordance with previous findings (Romijn and Albaladejo 2001; Baldwin and Hanel 2003; Becheikh et al 2006; De Jong and Vermeulen 2007; Mazzarol and Reboud 2011).

Regarding the novelty of innovation, our results indicate that investment into radical innovations may lead to higher expectation of profitability, in comparison with those firms focusing on incremental innovations. This finding is in line with the conclusions of Kleinschmidt and Cooper (1991), and Chaney et al (1991). Evidence from our study suggests that potential high rent earners tend to place more importance on the protection of IP rights than the firms that anticipated low rent returns. However, the firm's attitude towards IP protection also seems to depend on the type of innovation, plus the novelty and nature of its high or low knowledge-intensive sector. For example, high-tech firms were more likely to focus on the protection of IP when developing radical innovations rather than incremental innovations.

With regards to the preferential financing sources, mature and medium-sized firms tended to use predominantly retained profits to finance their innovations. In addition, firms which were

R&D intensive or engaged in radical innovation relied more on equity financing. This conclusion was in accordance with the findings in the report by Baldwin, Gellatly and Gaudreault (2002). Even though the types of innovation were insignificant in differentiating the innovation typology, the results indicated that more product innovations were developed in the clusters “radical innovators” and “investment-ready innovators”, whereas more process innovations were developed by “mature innovators”.

The results of our study suggest that young radical innovators may be more likely to have greater optimism that they can secure high innovation rent returns. By contrast, the optimism of the innovation return was much lower in mature and large firms which have more experience of commercializing innovations. This finding is in accordance with Fraser and Greene’s (2010) study which described the negative relationship between optimism and business experience. Similarly, Busenitz and Barney (1997) indicated that a small firm’s owners were found to be more likely to overestimate the successful probability in comparison to experienced executives. This idea supported our findings that young owner-managers seemed to have higher optimism of the anticipated return despite their unsystematic approach to the commercialisation process. As noted above, this is likely to be reflection of inexperience or naivety on the part of these owner-managers.

Based on the results of our study, some propositions could be suggested as follows:

- *Proposition 1:* There is a negative relationship between the anticipated innovation rent and firm age.
- *Proposition 2:* Young firms rely more on equity financing to develop their innovations in comparison to old firms.
- *Proposition 3:* The more the firm grows in size, the more it is likely to formalize the innovation commercialisation process.
- *Proposition 4:* Firms pursuing radical innovations tend to expect higher anticipated rent than those developed incremental innovations.

## CONCLUSION

This study contributes to the academic literature by developing a framework that is linked to the concept of the innovation rent (Santi et al 2003) and the formal commercialisation process suggested by Mazzarol and Reboud (2006; 2011). The innovator typology was mapped on the

framework with the aim to deepen the understanding of how firms commercialized innovation and what they expected to capture. By plotting the differentiating factors found amongst SMEs in commercializing innovation, the paper investigated firm characteristics and behavior to explain the reasons why some firms which approach the process of commercialisation systematically might have low expectations of potential rent return outcomes and vice versa. The findings suggest that the two measures of how systematic the commercialisation process is, and the anticipated potential rent return of the innovation, may be associated with other factors. These are firm age, size, the R&D intensity, the financing types, the IP protection and the novelty of innovation.

The study has implications for how SMEs might approach the management of innovation and suggests that approaching commercialisation in a systematic manner may engender more realism amongst entrepreneurs. Besides the age and size of firms, it is significant for innovation decision makers to consider the type of financing, costs and risks in undertaking high or low levels of technical novelty and value of the IP protection in the long term. In addition, this descriptive typology of innovators can be used to explain and distinguish firms' management characteristics and behaviour in developing innovations, which is beneficial for owner-managers, investors and policy makers.

The limitations of the study are that our focus on measuring the innovation outcome was based on the "anticipated rent". The erosion of the rent due to the competitive market, competitors and the "residual rent" were not yet considered in the analysis. It would be beneficial to extend the research into a longitudinal study to examine entrepreneurial optimism in-depth and compared with their real captured innovation rent. The follow-up investigation would strengthen the reasoning for the high optimism of young firms despite their non-systematic innovation management and the low optimism of the anticipated return from mature and medium- sized firms.

## REFERENCES

- Adams, R. Bessant, J. and Phelps, R. (2006). "Innovation Management Measure: A review", *International Journal of Management Reviews* **8**(1): 21 – 47.
- Alvarez, S. A (2007). "Entrepreneurial Rents and Theory of the Firm", *Journal of Business Venturing* **22**(3): 427-442.

- Alvarez, S. A and Barney, J. B (2004). "Organizing Rent Generation and Appropriation: Toward a Theory of the Entrepreneurial Firm", *Journal of Business Venturing* **19**(5): 621- 635
- Ames, E. (1961). "Research, Invention, Development and Innovation", *The American Economic Review* **51**(3): 370-381.
- Athey, S. and Schmutzler, A. (1995). Product and Process Flexibility in an Innovative Environment, *The R&D Journal of Economics* **26**(4): 557-574
- Archibugi, D. (2001) "Pavitt's Taxonomy Sixteen Years On: A Review Article", *Economics of Innovation and New Technology* **10**(5): 415–425
- Autio and Lumme (1998). 'Does The Innovator Role Affect The Perceived Potential For Growth? Analysis of Four Types of New, Technology-based Firms.' *Technology Analysis and Strategic Management* **10**(1): 41.–45.
- Baldwin, J. R. and Hanel, P. (2003). Innovation and Knowledge Creation in an Open Economy: Canadian Industry and International Implications, Cambridge University Press, UK.
- Baldwin, J. R; Jellatly, G. and Gaudreault, V. (2002). "Financing Innovation in New Small Firms: New Evidence from Canada", Statistics Canada Analytical Studies Series 11F0019MIE, Working Paper Number 190. Available at SSRN: <http://ssrn.com/abstract=316849>
- Barney, J. (1991). "Firm Resources and Sustained Competitive Advantage", *Journal of Management* **17**(1): 99 – 120.
- Barney, J. B. (1986). "Strategic Factor Markets: Expectations, Luck and Business Strategy", *Management Science* **32**(10): 1231 - 1241
- Becheikh, N., Landry, R., Amara, N., 2006. "Lessons from Innovation Empirical Studies in the Manufacturing Sector: A Systematic Review of the Literature from 1993–2003". *Technovation* **26**(5/6), 644–664.
- Bessant, J. (2003). High Involvement Innovation: Building and Sustaining Competitive Advantage through Continuous Change, Chichester: John Wiley.
- Blumentritt, T. (2004). "Does Small and Mature Have To Mean Dull? Defying the Ho-hum at SMEs". *Journal of Business Strategy*, **25**(1): 27-33
- Blundell, R., Griffith W., R., and Reenen J. V. (1999), "Market Share, Market Value, and Innovation in a Panel of British Manufacturing Firms," *Review of Economic Studies* **66**(3): 529–54.
- Boag, D. A., and Rinholm, B.L (1989). "New Product Management Practices of Small High Technology Firms", *Journal of Product Innovation Management* **6**(2): 109-122.
- Bracker, J. S. and Pearson J. N., (1986) "Planning and Financial Performance of Small, Mature Firms", *Strategic Management Journal* **7**(6): 503-522.
- Brozen, Y. (1951). "Invention, Innovation and Imitation." *The American Economic Review* **41**(2), 239-257.
- Brurne, E. (2005). "Intellectual Property Rights and Innovation in SMEs in OECD Countries", *Journal of Intellectual Property Rights* **10**(1): 34-43

- Busenitz and Barney (1997) "Differences Between Entrepreneurs And Managers In Large Organizations: Biases And Heuristics In Strategic Decision Making", *Journal of Business Venturing* **12**(1): 9-30
- Calantone, R. J. and di Benedetto, C. A. (1988). "An Integrative Model of the New Product Development Process: An Empirical Validation", *Journal of Product Innovation Management* **5**(3): 201–215.
- Canto, J. G. D. and Gonzales, I. S. (1999). "A Resource-based Analysis of the Factors Determining a Firm's R&D activities", *Research Policy* **28**(8), 891–905.
- Capon, N., Farley, J. U., Lehmann, D. R., and Hulbert, J. H. (1992) "Profiles of Product Innovators Among Large US Manufacturers", *Management Science* **38**(2): 157-169.
- Chaney, P. K., Devinney T. M., and Winer, R. S (1991), "The Impact of New Product Introductions on the Market Value of Firms," *Journal of Business*, **64**(4): 573–610.
- Cohen, W. and S. Klepper (1996). "A Reprise of Size and R&D", *The Economic Journal*, **106**(437): 925-951.
- Corner, K. (1991). "A Historical Comparison of Resource-based Theory and Five Schools of Thought within Industrial Organization Economics: Do We Have New Theory of the Firm?" *Strategic Management Journal* **17**(1): 121–154.
- Covin, J. G., and Prescott, J.E. (1990). "Strategies, Styles, and Structures of Small Product Innovative Firms in High and Low Technology Industries." *The Journal of High Technology Management Research* **1**(1): 39-56.
- D'Amboise, G., and Muldowney, M. (1988). "Management Theory for Small Business: Attempts and Requirements." *The Academy of Management Review* **13**(2): 226-240.
- De Jong, J. P. J. and Brouwer, E. (1999). "Strategic Study Determinants of the Innovative Ability of SMEs, Zoetermeer.
- De Jong, J.P.J., Vermeulen, P.A.M., 2007. "Determinants of Product Innovation in Small Firms". *International Small Business Journal* **24**(6): 587–609.
- Deeds, D. L., Decarolis, D., and Coombs, J. (2000). "Dynamic Capabilities and New Product Development in High Technology Ventures: An Empirical Analysis of New Biotechnology Firms." *Journal of Business Venturing* **15**(3): 211-229.
- Dewar, R., and Dutton, J. (1986), "The Adoption of Radical and Incremental Innovations: An Empirical Analysis", *Management Science* **32**(11): 1422 - 1433.
- Dibrell, C., Craig, J. and Hansen, E. (2011) "Natural Environment, Market Orientation, and Firm Innovativeness: An Organizational Life Cycle Perspective", *Journal of Small Business Management* **49**(3): 467-489.
- Dushnisky, G. (2010) "Entrepreneurial Optimism in the Market for Technological Inventions", *Organization Science* **21**(1), 150-167
- European Commission (2009). SMEs report, Technical report, European Commission. .
- Foster, W. K., and Pryor, A.K. (1986). "The Strategic Management of Innovation." *The Journal of Business Strategy* **7**(1): 38-42.
- Fraser, S. and Greene, F. J. (2006). "The Effects of Experience on Entrepreneurial Optimism and Uncertainty", *Economica* **73**(290): 169-192

- Gatignon, H. and Xuereb, J. M. (1997). "Strategic Orientation of the Firm and New Product Performance", *Journal of Marketing Research* **34**(1): 77-90.
- Geroski, Paul, Steve Machin, and John Van Reenen (1993), "The Profitability of Innovating Firms," *R&D Journal of Economics*, **24**(2), 198–212.
- Globe, S., Levy, G. W., and Schwartz, C. M. (1973). "Key Factors an Event in the Innovation Process", *Research Management* **16**(4): 8-15
- Gould, D. M and Gruben, W. C (1996) "The Role of Intellectual Property Rights in Economic Growth", *Journal of Development Economics* **48**(1): 323-350.
- Gresov, C. (1984). "Designing Organizations to Innovate and Implement: Using Two Dilemmas to Create a Solution." *Columbia Journal of World Business* **19**(4): 63-67.
- Harabi, Najib (1998). "Innovation Through Vertical Relations Between Firms, Suppliers And Customers: A Study of German Firms", *Industry and Innovation* **5**(2): 157-179.
- Helfat, C. E. and Raubiscek, R. S. (2000). "Product Sequencing: Co-evolution of Knowledge, Capabilities and Products", *Strategic Management Journal* **21**(10-11): 961-979.
- Herdman, R. C. (1995). *Innovation and Commercialisation of Emerging Technologies*, Printing Office of Technology Assessment, USA.
- Hirsch-Kreinsen, Hahn, H. and Jacobsen, D. (2008) "The Low- Tech Issue", in Hirsch-Kreinsen and Jacobsen, D (Eds), *Innovation in Low- Tech Firms and Industries*, Cheltenham, Edward Elgar Publishing, 3-24.
- Hoffman, K., Parejo, M., Bessant, J., & Perren, L. (1998). "Small Firms, R&D, Technology and Innovation in the UK: A Literature Review." *Technovation* **18**(1): 39-55.
- Huang, X., Soutar, G. N. and Brown, A. (2002). "New product development processes in SMEs: Some Australian Evidence", *Journal of Small Business Management* **40**(1): 27-42.
- Kessler, E. H. and Chakrabarti, A. K. (1999). "Speeding up the Pace of New Product Development", *Journal of Product Innovation Management* **16**(3): 231-247.
- Kleinschmidt, E. J. and Cooper R. J (1991), "The Impact of Product Innovativeness on Performance," *The Journal of Product Innovation Management*, **8**(4): 240–52.
- Kotabe M., and Swan, K.S. (1995). "The Role of Strategic Alliances in High-Technology New Product Development." *Strategic Management Journal* **16**(8): 621-636.
- Kraus, S., Harms, R., and Schwart, E. (2008). "Strategic Business Planning and Success in Small Firms", *International Journal of Entrepreneurship and Innovation Management* **8**(4): 381- 396."
- Leftwich, R.H., 1976. *The Price System & Resource Allocation*. Dryden Press, Hinsdale, IL
- Levin, R.C., A. Klevorick, R.R. Nelson and Winter S.G. (1987), "Appropriating the Returns from Industrial Research and Development", *Brookings Papers on Economic Activity* (3), Special Issue on Microeconomics, 783-831
- Lindman, M. T. (2002). "Open or closed strategy in developing new products? A case study of industrial NPD in SMEs." *European Journal of Innovation Management* **5**(4): 224-237.
- Loderer, C. F. and Waelchli, U. (2010) "Firm Age and Performance". Available at SSRN: <http://ssrn.com/abstract=1342248> or <http://dx.doi.org/10.2139/ssrn.1342248>.

- Mahoney, J. T and Pandian J. R (1992). "The Resource- Based View within the Conservation of Strategic Management", *Strategic Management Journal* **13**(5): 363- 380.
- Manove, M. (2000) "Entrepreneurs, Optimism and the Competitive Edge", *Boston University and CEMFI*.
- Mansfield, E. (1985), "How rapidly does industrial technology leak out?", *Journal of Industrial Economics*, **34**(2), 217-223..
- Markham, S. (1998). "A Longitudinal Examination of How Champions Influence Others to Support Their Projects", *Journal of Product Innovation Management* **15**(6): 490–504.
- Mazzarol, T. and Reboud, S. (2006). "The Strategic Decision Making of Entrepreneurs within Small High Innovator Firms." *International Entrepreneurship and Management Journal* **2**(2): 261-280
- Mazzarol, T. and Reboud, S. (2009). *The Strategy of Small Firms - Strategic Management and Innovation in Small Firm*, Edward Elgar Publishing Limited.
- Mazzarol, T., and Reboud, S. (Eds) (2011) *Strategic Innovation in Small Firms: An international Analysis of Innovation and Strategic Decision Making in Small to Medium Enterprises*, Edward Elgar, Cheltenham UK, Northampton, MA, USA.
- Mazzarol, T., Reboud, S., and Soutar, G. N. (2011) "Innovation Management and Commercialisation in Small Firms: A study of OECD Countries", International Council of Small Business, 56th World Conference, Stockholm, Sweden.
- Mazzarol, T., Reboud, S., and Volery, T. (2010), "The influence of size, age and growth on innovation management in small firms", *International Journal of Technology Management* **52**(1/2): 98- 117
- McGrath, R. G., Tsai, M. H., Venkataraman, S., & MacMillan, I. C. (1996). "Innovation, Competitive Advantage and Rent: A Model and Test". *Management Science*, **42**(3): 389-403
- McIntyre, S. H. (1982). "Obstacles to Corporate Innovation." *Business Horizons* **25**(1): 23-28.
- Miles, M., Paul, C. and Wilhite, A. (2003). "Modeling Entrepreneurship as Rent - seeking Competition", *Technovation* **23**(5): 393-400.
- Miller, D., and Friesen, P.H. (1982). "Innovation in Conservative and Entrepreneurial Firms: Two Models of Strategic Momentum." *Strategic Management Journal* **3**(1): 1-25.
- Miller, W. (2001). "Innovation for Business Growth", *Research Technology Management* **44**(5): 26–41.
- Moore, Geoffrey (1991, 2002) *Crossing the Chasm*. New York: HarperBusiness.
- North, D. and Smallbone, D. (2000) "The Innovativeness and Growth of Rural SMEs During The 1990s", *Regional Studies* **34**(2): 145- 157
- OECD (2000) *Small and Medium-Sized Enterprises Outlook*, OECD Publishing.
- OECD (2004). *Oslo Manual- The Measurement of Scientific and Technological Activities - Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, OECD Publishing
- OECD (2009). *Innovation in Firms - A Microeconomic Perspective*, OECD Innovation Strategy, OECD Publishing.

- OECD (2010). *SMEs, Entrepreneurship and Innovation*. Paris, Organisation for Economic Co-operation and Development.
- Pearson, G. (1990) "Management of Innovation in High Technology Small Firms." *R&D Management* **20**(2): 178-180.
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, 1985.
- Price, R. M. (1996) "Technology and Strategic Advantage." *California Management Review* **38**(3): 38-56.
- Quinn, J. B. (1985) "Managing Innovation: Controlled Chaos." *Harvard Business Review* **63**(3): 73-84.
- Rizzoni, A (1991) "Technological Innovation and Small Firms: A Taxonomy", *International Small Business Journal* **9**(31): 31-42.
- Reboud, S. and Mazzarol, T. (2003). "Risk Assessment in SMEs, a Proposed Tool", *Cahiers du CEREN* **4**: 31-40.
- Roger, M. (2004). "Network, Firm Size and Innovation", *Journal of Small Business Economics* **22**(2): 141-153.
- Rominjn, H. and Albaladejo, M. (2002). "Determinants of Innovation Capability in Small Electronics and Software Firms in Southeast England", *Research Policy* **31**(7): 1053-1067.
- Rosa, J and Rose, A. (2007) Report on Interviews on the Commercialisation of Innovation, Minister of Industry, Statistics Canada.
- Rothwell, R. and Zegveld, W. (1985). *Re-industrialization and Technology*, London, Longman.
- Rummelt, R. P (1987) "Theory, Strategies and Entrepreneurship" in Teece, D.J (ed.), *The Competitive Strategic Management*, Prentice- Hall, Englewood Cliffs, NJ: 556- 570
- Santi, M., Reboud, S., Gasiglia, H. and Sabouret, A. (2003). *Modele de Valorisation et de Protection Intellectuelle des Innovations des pei*, HEC / INPI .
- Schmidt, L. (1990). "The Innovative Attitude of Small and Medium-Sized Enterprises", *Journal of Small Business Management* **28**(1): 68–80.
- Schumpeter, J. A. (1934). *The Theory of Economic Development*, Harvard University Press, Cambridge.
- Slatter, S. F. and Mohr, J. J. (2006). "Successful Development and Commercialisation of Technological Innovations: Insight Based into Strategic Types", *Journal of Product Innovation Management* **23**(1): 26-33.
- Sundbo, J. and Fuglsang, L. (eds) (2002). *Innovation as Strategic Reflexivity*, Routledge, London and New York.
- Sweezy, P. (1943). "Professor Schumpeter's Theory of Innovation." *The Review of Economics and Statistics* **25**(1): 93-96.
- Szakonyi, R. (1994). "Measuring R&D Effectiveness - I", *Research Technology Management* **37**(2): 27–32
- Tidd, J. (2001). "Innovation Management in Context: Environment, Organization and Performance." *International Journal of Management Reviews* **3**(3): 169-183.

- Tushman, M. and O'Reilly, C. A. (1997). *Winning through Innovation. A Practical Guide to Leading Organizational Change*, Boston, Harvard Business School Press.
- Tushman, M., and Nadler, D. (1986). "Organizing for Innovation." *California Management Review* **28**(3): 74-92.
- Utterback, J. and W. Abernathy 1975. "A Dynamic Model of Process and Product Innovation." *Omega* 3, 639-656.
- Vermeulen, P. (2005) "Uncovering Barriers to Complex Incremental Product Innovation in Small and Medium-sized Financial Services Firms", *Journal of Small Business Management* **43**(4): 432-452
- Warusawitharana, M. (2011). "*Profitability and the Lifecycle of Firms*", Available at Social Science Research Network, SSRN: <http://ssrn.com/abstract=1568965>
- Wilks and Thompson, (1973) "The Sampling Distribution Of The Criterion Lambda When The Hypothesis Tested In Not True.", *Biometrika*, **29**(1/2): 124.-132.
- Zahra, S. A. and Das, S. R. (1993) "Innovation Strategy and Financial Performance in Manufacturing Companies: An Empirical Study", *Production and Operations Management* **2**(1): 15-37.