INNOVATION MANAGEMENT IN SMALL FIRMS: A COMPARISON OF FRENCH AND AUSTRALIAN COMPANIES

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ABSTRACT

This study examines the behaviour of small firms in both Australia and France and uses an innovation diagnostic measurement tool to provide benchmarking of their innovation management practices. Using a multiple case study methodology a total of 89 cases was drawn; 55 from Australia and 34 from France. The study compares the characteristics of the firms and their management teams, their perceptions of the innovation climate in their host country, their approaches to strategic decision making and previous success or failure in innovation. A focus is placed upon the firm's evaluation of the merits of a proposed innovation that is to be introduced within the next 3 years. This employs a risk assessment model developed by Santi, Reboud, Gasiglia and Sabouret (2003) and employed in further studies of small innovator firms in Australia. The study also examines the firm's current innovation management practices using a four-part framework which considers strategy, marketing, resource and innovation management.

Data collection involved selection of cases that were identified within small business and industry databases with a past track record of innovation, although the final cases were a cross-section of low to high innovation intensive firms. Face-to-face interviews were conducted with the entrepreneurs or senior managers of each company, using the diagnostic tool and typically took around two hours to complete. In some instances a second interview was undertaken in which the details of the diagnostic assessment survey were examined and discussed with the interviewee.

All data was then examined using a cross-case comparison and drawing upon benchmarks of innovation that included a larger dataset of up to 198 cases collected for the total study. Survey data contained ordinal scales allowing a quantitative analysis as well as interview data for a richer qualitative analysis. In keeping with the 'replication logic' of Yin (1989), the 89 cases selected for this study were examined to identify common patterns in the risk assessment profile and the innovation diagnostic measures. These were then matched with the firm's overall success within the market in terms of the commercialisation of their innovations.

Findings from the study suggest that systematic approaches to the management of innovation are more likely to provide enhanced success than a more random approach. The role of government in supporting small firms in their commercialisation was also highlighted as being important. Consistent with the findings from earlier studies the central role of leading customers in influencing the decision to proceed with an investment in an innovation was also highlighted.

The study has important implications for both entrepreneurs from small firms seeking to commercialise future innovations, and policy makers seeking to assist them. Providing small firms with assistance and education in the development of innovation management systems is of importance. These should ideally be benchmarked against international best practice. The study has provided an early attempt at the development of such an innovation management system and international benchmarking tool. Future research should focus on identification of and refinement of the measurement tools used for evaluating innovation in small firms, as well as understanding the relationship between innovation activity and successful commercialisation in such firms.

INTRODUCTION

This paper examines the behaviour of small innovator firms in Australia and France with a view to understanding how such firms manage innovation and to determine what effect their external environment has upon the firm's ability to commercialise innovations. Three research questions were addressed:

1. How do entrepreneurs from small innovator firms screen the risk-return profile of new innovations prior to investment?

2. How well do small firms manage their commercialisation processes and what impact does innovation management have on their success?

3. How does the national innovation system in which these entrepreneurs operate impact on the success or failure of their commercialisation?

ENTREPRENEURIAL INNOVATION AS A DRIVER OF ECONOMIC GROWTH

Innovation is a central element in entrepreneurship, creating as it does the necessary new entry of products or processes into markets that generates the opportunity for success. It is also a process that drives change in an enterprise's social and economic potential thereby generating value and wealth (Drucker, 1985). Within large organisations there is a need for all managers to recognise the importance of innovation and how to foster it among their employees (Stein & Pinchot, 1998). Innovation is also a vital element in the success of small firms (e.g. those with less than 250 employees) (OECD, 2004a). Such firms comprise the majority of businesses in most economies and have been recognised as a critical element in the national innovation system (SBA, 1986; OECD, 2004b).

Economic analysis of the relationship between research and development (R&D) activity as measured by the number of patents lodged, labour productivity and economic growth shows a strong correlation between these three elements (Crosby, 2000). This is recognised across the world and research suggests that a nation's innovation system is positively influenced by the level of investment in R&D, support for higher education, proportion of the workforce engaged in R&D, and the level of government support for innovation and commercialisation (Porter & Stern, 1999). In order to be economically useful, innovation must translate into commercialisation, which is the process of converting ideas and knowledge into applied outcomes typically as new products or business processes (Jolly, 1997). It requires more than mere creativity and inspiration, the process of commercialisation requires discipline, commitment plus sound management and planning (Drucker, 2002).

Technology has been a major driver of economic growth since at least the 19th Century with the pace of technological change accelerating through the past two hundred years into what is now viewed as a post industrial era (Senge, Carstedt & Porter, 2001). Of importance to national economic sustainability is the relative strength of a nation's innovation system. Porter and Stern (2001) have defined what they call the "National Innovative Capacity Framework" which is comprised of three broad elements. The first of these is the "Common Innovation Infrastructure", which in turn consists of three key components: i) the cumulative technological sophistication of the national economy; ii) the human capital and financial resources that are made available for R&D activity; and iii) the level of resources and policy commitments made by public authorities to innovation. The second element of the framework is the "Cluster-specific Environment for Innovation", which consists of the interrelationship between what Porter (1990) has identified as the diamond of competition (e.g. factor inputs, demand conditions, firm strategy and rivalry and related and supporting industries) taking place within industries. The third element is the quality of the linkages that exist between the common innovation infrastructure and the industry clusters in which individual firms compete.

The interrelationship between the various elements of a national innovation system impacts upon the level of R&D and commercialisation taking place within the economy. For example, regions that are well supplied with physical and information infrastructure (e.g. transportation, information and communications technologies) are more likely to be economically prosperous and innovative. The quality of the education and training system within a region can also have a positive influence by ensuring a steady supply of skilled employees and managers. Innovation is also fostered by the presence of locally based research centres such as universities. Government can also assist R&D and commercialisation through regulations protecting intellectual property rights (IPR), as well as assisting small firms with establishment costs or tax concessions (Porter, 2001). The level of innovation found among firms is contingent in part on its internal structure and the nature of its managerial leadership. However, the firm's external environment also impacts on its level of innovation and how successful it is in undertaking commercialisation activities. Regional economies are shaped by their local firms and it is important to focus policy support upon the small firms in order to enhance the overall level of innovation with the economy (Sternberg & Arndt, 2001).

INNOVATION IN AUSTRALIA AND FRANCE

Australia and France are both members of the OECD and both countries have advanced affluent economies. However, there are also many differences to be found between them. Australia is an island continent located in the southern hemisphere adjacent to South East Asia and the Pacific. France is in the northern hemisphere within Western Europe and is a founder member of the European Union. Table 1 provides a comparison of these two countries drawing upon OECD statistics from 2005. It can be seen that France has three times the population of Australia and over twice the GDP. However, Australia's real GDP growth rate is around 3 times that of France and its per capita GDP is slightly higher. The Australian economy is enjoying a boom period that has been driven by rising resource exports thereby keeping unemployment low or half of that found in France.

Table 1: A Comparison of Australia and France (2005)

COUNTRY	AUSTRALIA	FRANCE
Total population	20.3 million	60.9 million
Gross Domestic Product (GDP) (US $ billions)	$US 701 bn	$US 1,897 bn
Real GDP growth rate	2.8%	1.2%
Per capita GDP	$US 34,239	$US 30,266
Proportion of manufacturers that are small firms	94%	90%
Unemployment rate	5%	10%
Self-employment rate	13%	9%
Average hours worked during the year per person	1,730	1,546
GDP expenditure on R&D per annum	1.64%	2.16%
Number of persons employed in R&D per thousand	7.83	7.75%
Investment in ICT as a % of total non-residential fixed capital formation	21.5%	16.4%
Proportion of households with access to home computers	67%	50%
Proportion of households with access to the internet	56%	34%
Proportion of age group 25 to 64 years with tertiary level education	31%	24%
Expenditure per student in tertiary education: 2003 constant prices	$US 12,405	$US 10,704
Total expenditure as % of GDP on education institutions for all levels of education	5.76%	6.31%

Source: OECD Statistics (http:///stats.oecd.org)

An examination of the relative investments in R&D and education within the two countries shows that France spends slightly more of its annual GDP on R&D although both countries have broadly equal proportions of their population employed in R&D. Expenditure on education is also similar, although Australia has slightly more people with tertiary qualifications. In the field of ICT Australia has been investing more than France and more Australian households have access to both computers and the Internet. Both Australia and France have major agriculture sectors and innovation has been a major driver for agriculture in Australia as commodity prices became increasingly squeezed and the need for more sustainable production techniques increased. The need to maintain the effectiveness of innovation adoption and diffusion within the agriculture sector was a concern within Australia (Marsh & Pannell, 2000).

In terms of patenting activity France has substantially more patent families than Australia does. The OECD uses the concept of patent families, defined as *"a set of patents (originating from the priority filing) taken in various countries (i.e. patent offices) to protect the same invention"* (Dernis & Khan, 2004 p.7). Triadic patent families are based on the notion of a patent lodged across the three principal Patent Offices in the United States, European Union and Japan. In 2003 Australia had just over 431 triadic patent families recorded by the OECD as compared with 2,356 from France. However, while the total number of such patent families had grown by around 24 percent in France over the period from 1990 to 2003, the growth rate in Australia over the same period was 133 percent (OECD, 2007).

Despite this apparently good performance in terms of innovation within Australia, there has been a good deal of anguish expressed within that country over its international performance (Kerin, 2006). From the early 1990s a range of concerns were raised within the academic and scientific community over the relatively poor commercialisation rates within Australia's publicly funded universities and industry more broadly (Wood, 1992). This was also combined with concerns over the relative lack of venture capital markets in Australia and the low level of sophistication in these markets (Ferris, 2001). Australia was viewed as being at risk of losing any competitive advantage and becoming a 'third world economy" (Roach, 2000).

The response to these concerns by the Australian Federal Government was a series of policy measures known as "Backing Australia's Ability" (DCITA, 2004). These involved increasing the level of funding for fundamental scientific research at universities and major research centres, grants for investment in R&D infrastructure, and funding for commercialisation of new technology across a wide range of sectors, but particularly ICT and biotechnology. A strong emphasis was placed on inter-industry linkages and clustering activities, as well as strengthening the nexus between the universities and other publicly funded R&D centres, and industry (Molyneux, 2000). The need to develop Australia's national innovation system was identified as a key element of both Federal and State Government policy. While Australia ranked well in OECD terms for its overall investment in R&D, the past twenty years have seen a major rise in the level of private sector participation in R&D, and the university sector has significantly increased its role within the national innovation system (Garrett-Jones, 2004). Compared with the United States and United Kingdom, Australia's universities have performed well in terms of commercialisation (Yenken & Gillin, 2006).

A study of innovation within Australian industry undertaken in 2003 found that around 43 percent of businesses had engaged in innovation activity over the preceding three years, with a significantly higher proportion (23%) investing in process innovations than new products or services (17%) (ABS, 2003). Large firms (e.g. those with over 100 employees) were found to be more likely to invest in innovations than their smaller counterparts. A comparison of Australia's innovation levels was made with countries from the European Union. This showed that the total proportion of Australian businesses engaged in innovation was higher than the EU average (41%) and that Australia ranked seventh within the EU within the manufacturing sector and ninth in terms of the services sector (ABS, 2003). By comparison the proportion of firms engaged in innovation within France was found to be only 36 percent, and France ranked twelfth within the EU in terms of manufacturing and fifteenth for service firms (ABS, 2003).

Anguish over its international performance is also growing in France, as its lower performance inside an enlarged Europe is persistently interpreted by French analysts as a sign of decline (www.industrie.gouv.fr/observat/bilans/bord/cpci2006/2d.pdf). A focus on small firms shows that their situation in terms of growth and innovation is contrasted with a stagnation for very small firms (e.g. under 100 employees) and a better rate for larger firms (e.g. 100 to 500) (OSEO, 2006). Both the French Government (Ministère délégué à la Recherche & Ministère délégué à l'Industrie, 2003) and the "French Managers Association" (MEDEF, 2002) have decided to foster innovation in small French firms to help them innovate and grow. The French Government has decided to invest into innovation and the national innovation system, with four main objectives (SESSI 2006): i) help the actors of innovation process, ii) create a business environment that fosters innovation, iii) build a local dynamic in French territories, iv) define new axes for innovation policy. Several decisions were taken in order to reach those objectives, among which: specific helps for "start-ups" ("jeunes entreprises innovantes"), creation of local clusters ("Pôles de compétitivité"), creation of a special agency for innovation funding (OSEO, 2006).

MANAGING INNOVATION IN SMALL FIRMS

Although the innovation activity of larger firms may be higher than that of their small to medium counterparts, the role of small firms in the national innovation system remains significant. In the United States, for example, 67 percent of all innovations and 95 percent of radical innovations have been attributed to small firms (Timmons, 1998). The contribution of the small innovator firm has been acknowledged as a role model that should be emulated by their larger counterparts. As large firms seek to become more innovative they need to adopt the opportunistic, market focused, flexible model of the entrepreneurial small firm (Quinn, 1985). Entrepreneurial management is characterised by flat organisational structures, enhanced mutual trust between stakeholders, a greater level of ownership among stakeholders within the venture, and a culture based on trust and interpersonal ties rather than formal titles, legal power or rational authority (Gibb, 1988).

Although the popular image suggests that small firms are exemplars of entrepreneurship and innovation, this is perception needs to be tempered by the recognition that most small businesses lack a clear point of market differentiation and their continuous change in pursuit of new market opportunities ensures that they will appear highly innovative (Gibb, 2000). Upon closer scrutiny the level of innovation within small firms may vary significantly depending on the strategic aims and capacity of their leadership. For example, Khan and Manopichetwattana (1989) found five strategic types among a sample of small manufacturing firms in the United States. These types were: i) the “Young Turks”, characterised by younger, highly proactive, research focused risk taking entrepreneurial managers; ii) the “Blue Chips”, who focused on professionalism in the way they managed their firms; iii) the “Silver Spoons”, who were content to live on the strength of their past successes; iv) the “Striving Stoics”, who sought to manage well but lacked entrepreneurial flair and vision; and v) the “Kismets”, who had high external locus of control and saw their success as a product of luck. Of these five groups, the first two (“Young Turks” and “Blue Chips”) were found to be the most innovative.

These findings mirror those of Miles and Snow (1978) which found distinct strategic orientations among the senior management of large firms. Of these the “Prospector” and “Analyser” types were most likely to follow an innovation path compared to the “Defenders” and “Reactors” (Miles, Snow, Meyer, & Coleman, 1978). This strategic typology has been applied to small firms where it has been found that a key determinant in the selection of a strategic orientation is the personality of the entrepreneur(s) who own and manage the business and their propensity for proactively chasing new market opportunities via innovation (Vazquez, Santos & Alvarez, 2001; Kickul, & Gundry, 2002). The entrepreneurial manager’s ability to make sense of their environment and the role they should play is likely to determine what strategy they follow (Coopey, Keegan & Emler, 1997).

For small innovator firms engaged in technology-intensive industries, the role of technology is a key strategic consideration and requires a technology strategy focusing on the process of new product development (Berry & Taggart, 1994). An analysis of the technology entrepreneur found at least four types: i) the “Researcher”; ii) the “Producer”; iii) the “User”, and iv) the “Opportunist”. The first type is focused on R&D and often has a scientific or academic background, some are pure research focused and typically have limited commercial experience, while others are more commercially savvy. The second type is comprised of managers from larger firms who may be engineers and have a stronger track record in commercialisation. The third type is a manager who typically does not have a technical background (often marketing or sales), and is only indirectly involved in the R&D process. However, they are tasked to take the technology and apply it into a commercial environment. Finally, the last type is a manager who also has a non-technical background but who identifies an opportunity to apply new technology within their business (Jones-Evans, 1995). Of interest is the finding that managers from technology-based firms who have strong technical or scientific backgrounds are frequently less likely to seek a high growth strategy (Jones-Evans, 1996). In fact many small, technology-based firms may choose to adopt a niche strategy remaining small and focused, rather than seeking growth (Tether, 1997). This could be completed by other typologies linked to the origin and background of the managers "Craftsmen", with technical background and limited managerial experience vs. "Opportunists", with a broader experience and higher level of education (Woo, Cooper & Dunkelberg, 1991).

The small innovator firm that seeks growth will benefit from the formation of strategic networks (Ostgaard & Birley, 1994). An important aspect of such networks is the ability of the entrepreneur to form strong alliances with potential customers on one side and potential investors on the other (Erikson, 2004). Such strategic alliances are likely to be highly important to small innovator firms seeking to take their technology into international markets (Ruokonen, 2006). Of particular importance here is the ability of the entrepreneurial manager to establish strong personal ties with leading customers or key suppliers overseas, which can provide information on opportunities or threats facing the firm (Komulainen, 2006). The ability to forge and sustain such strategic network relationships is likely to be contingent on the entrepreneur’s capacity to trust others with whom they deal within these networks, and their ability to trade trust off against their own desire for independence (Brunetto & Farr-Wharton, 2007). However, a complimentary fit must be achieved between the strategy that underlies the strategic networking and the technology to be developed, or the overall level of innovation within the product might be impaired (Kotabe & Swan, 1995). They will also need to develop an organisational culture that values innovation and change, as well as attracting and retaining good people who work well in a team environment that is multi-disciplinary (Perry, 1995).

Innovation within small firms can involve the development of new products or services, the development of new markets or marketing methods, new process technologies within operations, or the application of technology or innovation to administrative systems (North & Smallbone, 2000). However, while there is a strong association between innovation intensity within the firm and the overall success of the business in terms of sales and productivity (Klomp & van Leeuween, 1999); the nature of the innovation and how it is managed can influence the firm’s overall growth rate and performance (Kemp, Folkeringa, de Jong & Wubben, 2003). For example, Autio and Lumme (1998) identified four types of innovative small firm: application, market, technology and paradigm innovators. The first simply apply existing technology to an existing market and are not particularly innovation intensive, their innovations are more market development in nature. The market innovators are good at combining existing technologies to form new product combinations and sell these into new markets. The technology innovators introduce new technologies into existing markets and frequently challenge the status quo with new products. Finally, the paradigm innovators are specialists in creating fundamental new technologies that involve radical shifts in the status quo and a deep R&D base. The growth rate of the paradigm innovators is likely to be faster than the others, but such firms are typically the smallest and face the most significant challenges (Autio & Lumme, 1998).

THE COMMERCIALISATION PROCESS

Assuming that the small firm is seeking to commercialise a new technology or use innovation as a key driver in their business, there will be a need for the management team to adopt a systematic process (Grupp & Maital, 2001). A strategic approach to innovation management, new product development and the commercialisation process is required (Stringer, 2000). The formation of a close partnering with leading customers and key suppliers in order to ensure a transfer of ideas to assist the development of the new product is also critical (Miller, 2001). For many small innovator firms that have a strong technology focus, the major point of focus is upon the R&D and technical development of the product itself.

However, success in New Product Development (NPD) within small firms is likely to depend equally upon their capacity to understand the market and to obtain formal assessments of the market and its acceptance of their new product (Huang, Soutar & Brown, 2002). This is particularly important where the innovation is radical or highly disruptive of a target market (Sandberg, 2002). The challenge of NPD is significant for both manufacturers and service firms, with most small firms suffering from a lack of resources and managerial expertise to undertake the commercialisation process (Vermeulen, 2005).

Whatever the size of the firm, NPD requires a systematic, holistic, flexible and continuous process that engages all the firm's employees and promotes a sharing of ideas and knowledge (Ozer, 2004). Successful NPD requires firms to have a culture supportive of innovation, senior managers that are committed to the process, and project teams that are organised, resourced and rewarded appropriately (Cooper, Edgett & Kleinschmidt, 2004a). In managing NPD best practice requires managers to undertake a portfolio approach continuously reviewing their best and worse case options, and matching often limited resources to emerging opportunities (Cooper, Edgett & Kleinschmidt, 2004b). Successful NPD depends on the firm's ability to match the customer's needs and offer superior benefits or better value for money (Cooper, Edgett & Kleinschmidt, 2004c). Finally, the NPD process takes place within a wider context of innovation management for which there are at least seven distinct elements: i) inputs, such as human creativity, ideas and resources (both physical and financial); ii) knowledge management, iii) strategy, both the NPD strategy and the overall business strategy; iv) organisation and culture; v) portfolio management; vi) project team management; and vi) commercialisation, which involves taking the product to market either directly or via joint ventures and alliances (Adams, Bessant & Phelps, 2006). It is not a linear process but one that requires senior management to be flexible and adaptable within dynamic technological and market environments. Small entrepreneurial firms where the senior managers also have equity and personal finances tied up in the venture, are more likely to focus on success within the commercialisation process (Mattes, Stacey & Marinova, 2006).

METHODOLOGY

This study examined the innovation management practices of 89 small firms from France and Australia. It builds upon the work undertaken by Santi, Reboud, Gasiglia and Sabouret (2003), Mazzarol and Reboud (2005; 2006) and Reboud and Mazzarol (2006) that examined the strategic decision making of entrepreneurs in small firms seeking to commercialise a new innovation. The methodology followed a multiple case study design involving face to face interviews with the CEO of each firm who in most cases was the entrepreneur who owned all or most of the equity in the venture.

The use of case study method has been acknowledged as having particular value to studies of small firms (Chetty, 1996). Case studies offer useful methodology for examining contemporary phenomenon within a real-life context, particularly where the boundaries between the phenomenon and its context are unclear (Yin, 1981). Cross sectional surveys employing quantitative analysis and experimental designs aim to isolate the phenomenon from its context so

as to control variables in order to understand their relative impact on events. Historical analysis examines context but is often subject to control problems because of a paucity of data or bias in the documentary record. By comparison the case study enables a phenomenon to be examined within its context and thus links these two together (Yin, 1982).

In keeping with Yin's (1989) case study research design guidelines, the author's developed a series of research propositions that built on the original research questions, then identified and defined the units of analysis within each case, prepared a detailed case study protocol which made use of a diagnostic questionnaire based on the strategic innovation screening tools developed by a joint French-Australian team (Santi, et.al., 2003; Mazzarol & Reboud, 2005; 2006). This questionnaire was prepared in an EXCEL spreadsheet with macros and enabled the researcher to quickly generate a report for the interviewee that provided feedback on their results and permitted a more in-depth analysis and discussion of the units of analysis. The diagnostic questionnaire and case study protocol had been developed via pilot study as recommended by Yin (1982), and had involved translation of the materials into both French and English. The use of case study surveys is a well recognised as a useful methodology where it is desirable to undertake cross-case comparisons that have enhanced reliability (Yin & Held, 1975). Case surveys can provide a useful bridge between the conventional quantitative survey and the qualitative approaches more common with case studies (Larsson, 1993). The study was aimed at testing theory rather than theory generation (Eisenhardt, 1989), and followed a replication logic with a relatively large number of cases serving to enhance the findings ability to be viewed as having external validity (Yin, 1989). Data collected from the diagnostic questionnaire and discussion protocol provided a chain of evidence allowing both within case and cross-case analysis (Miles & Huberman, 1979; 1984). The study focused on four research propositions:

- **Proposition #1** – Strategic intent within the small innovative firm is likely to be contingent upon and supported by the entrepreneur rather than the organisational structure of the firm.

- **Proposition #2** – Future strategies within the small innovative firm are likely to be built upon existing competencies and resources with learning by doing playing a much greater role within the venture than formal business planning.

- **Proposition #3** – Due to resource scarcity the small innovative firm is more likely to seek access to existing resources from within strategic networks external to the organisation rather than trying to develop them in response to opportunities.

- **Proposition #4** – Finally, due to resource scarcity the small innovative firm is more likely to seek to secure a niche within the market than to follow a more generic positioning strategy. This suggests that the small innovator firm is likely to follow a focus strategy (Porter, 1980; 1991).

The key units of analysis addressed within the study were:

1. The manager's perception of the external environment's influence on innovation;

2. The factors that influenced past success or failure of innovation within the firm;

3. The manager's perception of the commercial value of the next innovation they were seeking to commercialise; and

4. The effectiveness with which they were managing innovation within the firm.

Case study selection was undertaken on the basis of size and level of innovation. The OECD (2004a) definition of small firms and innovation (OECD, 2001) was used to define the parameters for case study selection. Data collection was undertaken by postgraduate students and the authors via face-to-face interviews in which the cases were initially identified from government

databases of innovative small firms, and after an initial contact letter was sent to the CEO of the company explaining the study and seeking their participation. At least one, sometimes two or more interviews, took place in the data collection phase. Each interview lasted around 2 hours and involved the respondent completing the questionnaire as well as a discussion of its outcomes plus a review of the interviewee's historical background in relation to their personal and business activities. Where possible data from the interviews was taped and later transcribed.

The respondents comprising the sample were predominately male (93.3%) of whom the majority (73%) were under the age of 40-49 years. A chi-square test found no differences between the French or Australian sub-populations in terms of age or gender. The majority of the respondents described themselves as "owner-managers" or "executive manager/principal shareholder", suggesting that their business structure was relatively simple and that they have full responsibility for all decisions. Only a small proportion was pure managers without equity in the venture. The case study firms were drawn from a variety of industries, although the largest proportion (36%) was manufacturers, which is explained by the desire to find firms that had clearly identifiable innovations. In keeping with the OECD definition of small firms, the case study firms had less than 250 full time employees. The French firms were slightly larger than their Australian counterparts, with an average of 120 full time employees compared to 83 employees.

The French firms were significantly older than their Australian counterparts with an average age of 42 years compared to 12 years. The characteristics of these cases are shown in Table 2 where it can be seen that the French firms were generally larger in terms of both employment size and the annual turnover. An analysis of the growth rate of these firms over the previous 3 years found that both the Australian and French groups had experienced significant growth (as measured by *t*-tests at the 0.05 level) in both employee size and turnover.

Table 2: A Comparison of Australian and French Case Study Firms

CHARACTERISTICS	AUSTRALIA	FRANCE
Average age of the firm	12 years	42 years
Average number of full time employees	83	120
Average number of full time employees 3 years previously	66	116
Average gross annual turnover	$US 14.2 million	$US 32.9 million
Average gross annual turnover 3 years previously	$US 11.8 million	$US 30.1 million
Average investment in innovation as a % of annual turnover over previous 3 years	22.05%	6.25%
Proportion of firms planning a technological product innovation	81.8%	55.9%

It can also be seen from Table 2 that the average level of investment in R&D as a proportion of total annual income was significantly higher among the Australian firms than their French counterparts. The Australian firms were also significantly more likely to be planning to develop a technological product innovation than were the French firms. According to the OECD definition a technological product or process innovation is:

> *A technological product innovation is the implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these* (OECD, 2001: p.9).

This disparity in the level of technological innovation between the Australian and French firms is reflective of the geographic areas from where the cases were drawn. The Australian firms were drawn primarily from Western Australia, a resource rich area that has attracted a lot of small firms who support the mining and resources economy, and where there has been a strong emphasis on innovation in biotechnology, minerals processing, ICT, marine engineering and offshore oil and gas. Many of the French firms were drawn from the Bourgogne region of France that is a world renowned centre of agriculture and wine production, but not oriented towards growth and innovation.

PERCEPTIONS OF THE EXTERNAL ENVIRONMENT

The CEO in each case study firm was asked to comment on their perceptions as to the general climate of innovation within their country. This perception is mentioned by the literature as having strong influence over the small business manager's strategic decision making (Lefebvre, Mason & Lefebvre, 1997). This was explored with a series of questions that examined how easy or difficult they felt it was to manage a competitive, innovative firm within their country. Key issues examined were access to a skilled and educated workforce, the cost of doing business, the geographic distance to key markets, access to external financing, ability to find and recruit high quality management staff, lifestyle, access to university and other research centres, government support for innovation, compliance costs and regulations, and the quality of the communications infrastructure. Table 3 summarises the findings from these questions.

As shown in Table 3 the majority of firms in both France and Australia disagreed with the view that it was easy to access a workforce with the necessary skills and education. Australian firms were significantly more negative than their French counterparts, which is potentially explained by the general skills and labour shortage currently found in Australia arising from the economic boom. This is particularly pronounced in Western Australia, a State at the centre of the resources sector with construction, mining and offshore oil and gas industries that are rapidly absorbing any available skilled labour. Both countries also had a fairly negative view of the availability of high quality managerial staff, although once again the Australians were more negative.

In terms of the cost of doing business both country groups were quite negative, however, the French firms were significantly more negative than the Australians. This is coherent with the general feeling of French managers that firms are overtaxed in France. This feeling is generally even stronger among French small business managers, especially since the implementation of the Law recommending the 35 hours working week.

The issue of geographic distance to markets did not evoke particularly strong views and there was a high degree of unanimity found between the Australian and French firms. Given the fact that Australia, in particular Western Australia, is considered geographically quite distant from most major industrial markets, this result was somewhat unexpected. Discussions with the CEO respondents from the Australian firms suggest that even those who are engaged in exporting have grown accustomed to long distance air travel. It is not uncommon for CEO of Australian high technology small firms to have to travel overseas to Europe or North America frequently in order to maintain direct contact with leading customers (Mazzarol, 2007).

With respect to the availability of external financing both the Australian and French firms were fairly negative about their ability to access venture financing and loans from banks. Sixty-five percent of both the Australian and French firms were either negative or equivocal over the ease with which they could access external debt or equity financing. When asked about the relative importance of different types of financing, the majority of firms viewed retained earnings as their most valuable source of capital. Seventy-three percent of Australian and 94 percent of French firms rated retained profits as either important or very important to their ability to fund innovation.

Table 3: Australian and French Firms Perceptions of the External Environment

[Items rated on 5-point scale where: 1 = totally disagree; 2 = disagree; 3 = more or less; 4 = agree; 5 = totally agree]

ITEM	COUNTRY	N	AGREED	MEAN	STD. DEVIATION	T-TEST
It is easy for our business to access a workforce with the necessary skills and education?	Australia	55	18.2%	2.44	.996	.026*
	France	34	24.7%	2.94	1.071	.030*
The cost of doing business is low in comparison to other countries?	Australia	55	14.5%	2.44	.977	.004*
	France	34	5.8%	1.79	1.008	.004*
Geographic distance to key markets is not a problem for our business?	Australia	55	45.5%	3.02	1.381	.180
	France	34	49.5%	3.41	1.258	.171
It is easy for a business such as ours to access external financing (e.g. banking or venture capital) to fund future growth?	Australia	55	34.6%	2.78	1.243	.285
	France	34	35.3%	3.06	1.071	.269
It is easy for a business such as ours to find and recruit high quality managerial staff to assist with future growth?	Australia	55	10.9%	2.24	.942	.034*
	France	34	23.5%	2.71	1.088	.042*
The lifestyle in this country enhances our business?	Australia	55	70.9%	3.71	.994	.058
	France	34	60.7%	3.26	1.163	.069
It is easy for a business such as ours to access high quality research centres (e.g. universities) locally?	Australia	55	41.3%	3.29	.994	.713
	France	34	44.2%	3.21	1.149	.722
Government support for local innovators is strong?	Australia	55	23.6%	2.67	1.037	.130
	France	34	14.7%	2.32	1.065	.134
The regulations governing business operations in this country (e.g. patent laws, taxation, corporate governance rules) are excellent for our business?	Australia	55	18.2%	2.65	1.022	.975
	France	34	32.3%	2.65	1.178	.976
The communications infrastructure in this country (e.g. roads, telecommunications, and internet services) is excellent for our business?	Australia	54	66.6%	3.67	1.133	.006*
	France	33	90.9%	4.27	.626	.002*

***t*-test is significant where $p < 0.05$

Australian firms were found to be more positive as to the importance of equity financing than their French counterparts. For example, 65 percent of Australian firms indicated that they viewed equity financing (e.g. sharing equity with venture capital investors) as important to their firm's future success in commercialisation of their innovation. By comparison 70 percent of the French firms considered that equity financing was of little or no importance to their future success in commercialisation. These differences may be explained by the fact that the Australian firms had a much higher proportion of enterprises seeking to commercialise a technological product innovation, which by nature are likely to require more investment over shorter time periods.

Lifestyle within a country or region has been associated with enhanced levels of innovation due to its ability to attract and retain creative, entrepreneurial people who bring their skills, talents and expertise (Florida, 2002). Both the Australian and French respondents expressed quite positive views that the lifestyle in their countries enhanced their business. During the interviews many of the entrepreneurs within the Australian group noted that their decision to base their firm where it was had occurred primarily as a result of chance or "personal and family" reasons. With their customers mainly within international markets, these entrepreneurs felt that they could easily relocate their business to another city or even country should they so chose. This supports the view that a region's ability to attract and retain entrepreneurial people may be in part dependent on lifestyle factors (Florida, 2000). Highly innovative regions are more likely to be those with a fairly transient population in which individuals can move in, quickly establish themselves, and also leave just as quickly due to relatively low social capital (Florida, Cushing & Gates, 2002).

The elements the "National Innovative Capacity Framework" as defined by Porter and Stern (2001) were also explored, with attention given to the accessibility of research centres for R&D, the level of government support for innovator firms, regulatory and compliance issues, and the quality of the national communications infrastructure. As shown in Table 3 the majority of firms were generally negative over these matters, with the exception of the quality of communications infrastructure (e.g. roads, telecommunications and internet services). Australian firms were found to be significantly more negative than French firms over this latter issue, but there were no significant differences found between the two countries on the other areas (as measured by a series of *t*-tests of the mean rating scores for each item within the survey findings).

A major negative for many of these firms was their perception that the government support for innovation was overly bureaucratic and complex to engage with, and that local universities and publicly funded research centres were also remote. This response depended on the nature of the business. For example, some of the Australian firms were spin-outs from one of the local universities and as a result had strong ongoing strategic links with them, even to the extent that their staff were joint appointments to the academic faculties from which the research had started. However, for those firms that had no previous links to the local universities, there was a general feeling that accessing such research centres was either too difficult or unnecessary.

This feeling of the French firms can probably be linked with the generally difficult relationships that exist between French universities and French firms. The actual level of sentiment across the region might also be even higher because of the specificity of the Bourgogne region in contrast with other more dynamic French regions. The Bourgogne region suffers from a lack of research institutions and universities that can partly explain this appreciation.

These findings provide a useful comparison between the Australian and French companies and suggest that in most cases there are few differences to be found between them. What differences have been identified can be readily explained in the context of Australia's rapid growth, major geographic distances, small population and lack of significant investment in infrastructure by Federal and State Governments relative to the economic growth rate. French views that the cost of doing business in France is worse than many other countries may reflect the relatively high taxation rates experienced within France for business.

PAST SUCCESS & FAILURE IN INNOVATION

Attention was also given to the previous success and failure these firms had had with innovation and its commercialisation. The respondents were asked to consider first one successful and then one unsuccessful commercialisation project that they had sought to undertaken during the past three years. The nature of this innovation was also examined along with reasons for this success or failure. The analysis framework used for this set of questions was drawn from the strategic management theories of Porter (1980) and the innovation diffusion theories of Rogers (1995).

The majority of successful innovations cited by the Australian firms were product/service innovations (69%). By comparison half the French firms cited a product/service innovation, with 23 percent citing process innovations and 20 percent market development innovations. Table 4 provides the findings from the survey which rated the importance of each factor in relation to its impact on the success of past commercialisation activities.

Table 4: The Importance of Factors for Success in Innovation

[Items rated on 5-point scale where: 1 = not important; 5 = very important]

	COUNTRY	N	MEAN	STD. DEVIATION	T-TEST
The general attitude of the targeted customers toward new innovations?	Australia	55	4.24	.922	.016*
	France	31	3.65	1.305	.031*
The innovation's ability to meet the needs of the targeted customers?	Australia	55	4.67	.511	.113
	France	31	4.42	.958	.179
The targeted customers' ability to see the benefits offered by the new innovation?	Australia	55	4.58	.658	.000*
	France	31	3.39	1.202	.000*
The bargaining power within the targeted market of your key suppliers (e.g. to control input prices)?	Australia	55	2.87	1.292	.013*
	France	30	2.13	1.279	.014*
The bargaining power within the targeted market of your leading customers?	Australia	55	3.24	1.201	.124
	France	30	2.77	1.547	.113
Competition with another equivalent innovation?	Australia	55	3.05	1.533	.141
	France	30	2.53	1.570	.146
The protection of the intellectual property upon which the innovation was based?	Australia	55	3.51	1.464	.000*
	France	30	2.03	1.450	.000*
The bargaining power within the targeted market of other firms with complementary products or services?	Australia	55	2.78	1.301	.034*
	France	31	2.16	1.241	.032*
The influence of government regulations or compliance costs?	Australia	55	2.64	1.495	.231
	France	30	2.23	1.431	.227
The level of competition within the targeted market?	Australia	54	3.19	1.245	.264
	France	30	3.50	1.196	.259
The reaction of major competitors within the targeted market to your innovation?	Australia	55	2.82	1.307	.619
	France	30	2.67	1.398	.627
Your firm's ability to access technological resources?	Australia	55	3.95	1.129	.001*
	France	30	2.93	1.484	.002*
Your firm's ability to access managerial & commercial resources?	Australia	55	3.38	1.367	.154
	France	30	2.93	1.388	.158
Your firm's ability to access financial resources?	Australia	55	3.38	1.298	.029*
	France	30	2.73	1.258	.028*
The targeted customers' willingness to switch to alternative products/services?	Australia	55	4.00	1.202	.069
	France	30	3.47	1.408	.085

***t*-test is significant where $p < 0.05$

Overall the most important factor influencing successful commercialisation was the innovation's ability to meet the needs of the targeted customers. This was followed by the targeted customer's ability to see the benefits offered by the new innovation. As can be seen from Table 4, there were significant differences found between Australian and French firms over these two issues. The general attitude of targeted customers toward new innovations was of third importance to success, and once again the Australian firms were found to rate this issue as of greater importance to success than the French firms. The higher level of importance placed upon these issues by the Australian firms is explained by the greater proportion of firms within the Australian group that were engaged in the commercialisation of new technological product innovations, as compared with the French firms who tended to have a greater proportion of process or market development innovations.

Other areas of difference between the Australian and French firms were the bargaining power within the targeted market of key suppliers, the protection of the intellectual property upon which the innovation was based, the bargaining power in the target market of other firms with complimentary products or services, and the firm's ability to access technological and financial resources. In each case the Australian firms rated these issues as being significantly more important to the success of their innovation than their French counterparts did. These differences are difficult to fully explain, although the higher concentration within the Australian group of firms of those with a strong emphasis on technological product innovations may help to explain it in part. Such firms saw intellectual property rights as being of key importance to their ability to secure and sustain a competitive advantage, they also were more likely to require technical and financial resources and the support of key suppliers in order to commercialise their innovations.

The same items were reviewed in relation to the failure of innovations to get to market, and the attitudes of customers were once again among the most important factors. Also of importance was competition from rivals or competitor products. Australian firms were again found to place a higher level of importance on the targeted customer's ability to see the benefits offered by the new innovation as a cause of failure. They also rated the importance of the protection of IP rights much more highly than their French counterparts. These results indicate that once again, Australian firms were reporting customer issues and the need to protect IP as of significantly greater importance than their French counterparts. It seems that some differences exist over the relative importance placed upon customer acceptance and IP management between these two sub-samples.

The meaning of these results is difficult to assess. As noted above, it may suggest that Australian firms are operating in a more competitive market environment, or that they are more acutely aware of these issues than their French counterparts. It might be related to the growth orientation of the Australian companies, and thus supports other research, suggesting that small firms that exhibit a systematic scanning of their environment, allows them to better exploit niche opportunities as compared to larger, more established firms that follow a more incremental product improvement process within their existing markets only (Mosey, Clare & Woodcock, 2002).

The result relating to IP management is of particular interest. Australian firms rated IP protection much higher as both a factor influencing success and failure. An interesting question is whether or not this suggests that the environment or markets into which the Australian firms are operating are more hostile in relation to IP protection than is the case in France. It also seems that French small firms find the protection of IP rights difficult to access and very expensive. This might be due to a different system of IP regulation, or a different perception of IP rights management among the French firms. There was a sense that IP management was more a legal issue of special interest to large firms in France, rather than a strategic issue of importance to small firms in Australia. The Australian Governments at both Federal and State level have sought to promote the importance of innovation over recent years and this has included an enhanced recognition of the role of IP. The Federal Government patents office – IP Australia – has also done much to make it easier for small firms to access its services and register online.

PERCEPTIONS OF THE NEXT INNOVATION

The respondents were asked to indicate whether or not they were planning to introduce a new innovation within the next 3 years. All were planning to do so and the majority of firms were planning to introduce a product-service innovation of some kind. The majority of these (72%) were described as "technological product innovations" (e.g. the implementation/ commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer). A large proportion (60%) was also described as "technological process innovations" (e.g. the implementation/ adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these).

As has been noted the Australian firms were significantly more likely than their French colleagues to be seeking to develop a technological product innovation. This may explain why the Australian firms were more sensitive to the issues associated with customer acceptance and IP protection than their French counterparts. A technological product innovation will be more likely to face such problems as customer acceptance barriers, the ability to access technological and financial resources, and IP protection issues than a technological process innovation. Interestingly the French firms were more likely to be focusing on market development innovations than their Australian colleagues.

The majority of these innovations (61%) were to integrate into a system rather than working alone and there was an even distribution of innovations that substituted an existing product or service (47%) as opposed to creating a new market (53%). No differences were found between the French and Australian firms on these issues. However, French firms were much more likely than their Australian counterparts to view their innovations as compatible with existing products and processes. These results may be explained in terms of the Australian firms seeking to develop technological product innovations more than the French firms. Eighty-five percent of the French firms indicated that their innovation was compatible with existing products or processes, while 53 percent of the Australian firms claimed that their innovation created a new standard or system.

From these findings, and those in other items listed above, it would seem that there are few easily identifiable country-specific differences between the French and Australian companies. The major differences appear to be explained in terms of whether the firm was seeking to develop a technological product or technological process innovation.

The diagnostic questionnaire used in the case study interviews drew upon a screening tool first developed by (Santi, et. al, 2003) and further refined by (Mazzarol & Reboud, 2005; 2006). This screening tool employs a model of the potential rent-return (RENT) from a future innovation that is a function of three variables: i) Volume – as measured by the volume of sales over a year; ii) Rate – the profit margin likely to be generated from the innovation; and iii) Length – the duration of the life-cycle of the innovation (Santi, et. al. 2003). This can be illustrated in the following formula:

RENT = VOLUME X RATE X LENGTH.

In this process the potential returns are influenced by the volume of sales generated from the innovation, its profitability and the length of time that the innovation can be maintained in the market before its competitiveness is eroded by competitors or substitutions. Profitability is a critical issue and is determined by the price-cost relationship of the innovation. As the combination of these three variable components, a rent can be characterised by its extreme profile: large/small volume; high/low rate of margin and short/long life cycle. With two possibilities for each variable the total number of combinations is eight. Prior to introducing the innovation to the market a first step for the small firm would be to analyse the expected amount of potential

rent. Measuring the volume, rate and length of the anticipated rent to be generated by the innovation before any interaction with market forces is therefore a desirable initial stage.

In developing the screening tool the RENT return for the proposed innovation was measured using six items within the questionnaire that encompass: i) two items for volume (market adoption rate and anticipated sales); ii) two items for rate (estimated gross and net profit margin); and iii) two items measuring anticipated length (the complexity of the technical base of the innovation and ease of replication by competitors). Six potential RENT configurations can be identified using this framework (Santi, et.al, 2003)

Each configuration involves different levels of volume, rate and length thereby determining the anticipated rent to be derived from the innovation. These configurations are labelled: 'Shrimp', 'Champion', 'Gadget', 'Joker', 'Flash in the Pan', or 'Oasis' (Mazzarol and Reboud, 2005). These may be further described in the following terms: i) Shrimp – a configuration offering low rent potential due to its modest levels of volume, rate and length. As such it is unlikely to be of much interest; ii) Champion – a configuration with high potential rent; iii) Gadget – a configuration offering low volume and length but high rate, leading to little interest overall. Such a configuration would not justify significant investment; iv) Joker – configuration with high volume and length but low rate making it little better than the 'Gadget' despite it's apparently attractiveness; v) Flash in the Pan – a configuration with good volume but poor length and may experience both high or low rate, making it challenging for the investor that may need to outlay substantial capital to secure the return over the short life cycle; and vi) Oasis – a configuration that offers good length but low volume and high or low rate.

While the "Champion" configuration appears the most desirable, the "Oasis" configuration may be more suitable for a small firm because the small overall volume of sales may be more readily exploited by the small firm (Santi et. al. 2003). Such an innovation opportunity is essentially that found in a niche market. However, the capacity of the small firm to secure a desirable rent return from its innovation is likely to depend on its resources, the nature of the innovation and the characteristics of the market environment into which it is seeking to diffuse the innovation. Key forces likely to influence the market environment include the power of customers and their capacity and willingness to adopt the new innovation, the power of competitors and the capacity for new market entrants and substitution threats to erode the competitive advantage of the innovation (Porter, 1980).

Table 5: The RENT Configurations

	AUSTRALIA	FRANCE
shrimp	3	10
champion	30	2
gadget	4	5
joker	1	4
flash in pan	9	7
oasis	8	6
Total	55	34

The average Australian firm's RENT configuration was that of a CHAMPION, while the average French firm's RENT configuration was that of a SHRIMP. The actual break down of RENT configurations is shown in Table 5 where it can be seen that just over half the Australian firms (54%) reported CHAMPION type configurations, while some 29% of the French firms reported SHRIMP configurations.

MANAGING INNOVATION WITHIN THE FIRM

While the RENT configuration model outlined in the previous section provides an insight into the potential return the small firms might yield from their innovations, it does not provide a picture of how well they are managing their commercialisation process. Just having a good innovation is not sufficient to guarantee success. What is required is the ability to develop an effective business case (Appiah-Adu & Singh, 1998; Akgun, Lynn & Byrne, 2004). To achieve this, the diagnostic questionnaire contained an additional innovation management measure "the innovation diamond" that mapped the performance of each firm's current management practices against four indices: i) Market Index – a measure of the firm's focus on customer needs and how the new innovation offers customers value for money; ii) Innovation Index – a measure of the firm's formal process of new product development, and its management of intellectual property (IP); iii) Resources Index – a measure of the firm's technological, human, financial and managerial resources; and iv) Strategy Index – a measure of the firm's strategic planning in relation to its commercialisation process (Mazzarol & Reboud, 2006).

Each "index" comprised a total of ten items that were scored with a 5-point rating scale where the responses were recorded as an indicator of whether or not the respondent had considered or undertaken a particular procedure or process (where 1 = not at all, 5 = totally). Scores could range from 0 to 10 with 5 being the average for each of the four indexes. Where firms scored below 5 it was recommended in the discussions with the firm's CEO that action should be taken.

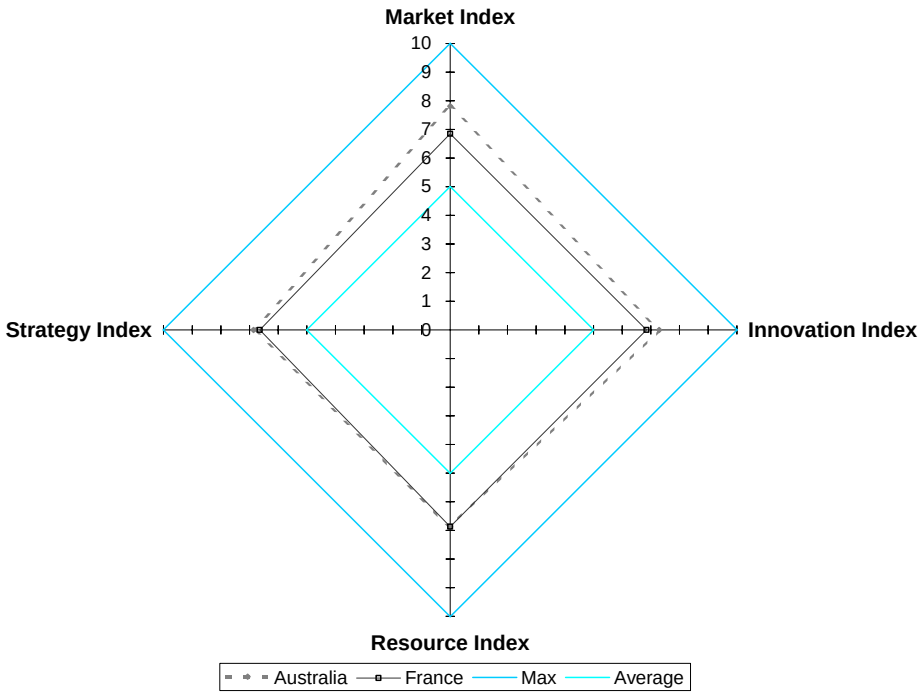

Figure 1: Innovation Diamond

As shown in Figure 1, the differences between the Australian and French firms in relation to the Innovation Diamond framework were modest. No statistically significant differences were found between the French and Australian firms in relation to their Strategy, Resource or Innovation indices, although the Australian firms were found to have significantly higher performance on the

Market index. Here the main areas of difference were in terms of the level of market research undertaken in order that the firms' had a sound understanding of what their customers' needs and wants were in relation to the new products or services they were seeking to commercialise. However, in relation to the Innovation Index measures, the French firms were found to be less likely to engage customers in the new product development process, and less likely to make use of confidentiality agreements to protect their IP rights. Australian firms were also found to have given greater thought to the bargaining power of key suppliers than their French counterparts.

CASE STUDY ANALYSIS

While at first glance the RENT configuration results suggest that the French firms were less successful with their innovations than the Australians, this was not necessarily the case. To better understand this situation a group of 12 cases were selected from the total pool of 89 firms for further analysis. The selection of these cases was based on the RENT configuration with a representative of each type selected from within the Australian and French sub-populations. An examination of the RENT configuration results of each case and their scores on the "innovation diamond" framework is shown in Table 6. All names are pseudonyms to protect identities.

Table 6: The RENT Configuration Case Studies Innovation Diamond Results

RENT:	COUNTRY:	CASE:	M-SCORE	I-SCORE	R-SCORE	S-SCORE
Shrimp	Australia	CONSTRUCO	6.4	4.0	5.4	5.2
	France	STRUCO	4.8	5.4	7.0	3.8
Champion	Australia	AIRCON	7.2	9.2	7.4	7.8
	France	CLIMCO	8.2	6.8	6.2	7.4
Gadget	Australia	FURNCO	6.8	7.0	6.6	6.4
	France	DATACO	8.4	6.6	6.6	5.8
Joker	Australia	PARTCO	9.0	10.0	8.8	8.2
	France	AUTOCO	7.6	7.6	8.6	8.6
Flash in Pan	Australia	FRIGCO	8.8	5.2	6.8	6.2
	France	SCIENCO	4.2	6.6	5.8	5.6
Oasis	Australia	OFFCO	6.4	6.0	6.0	5.6
	France	MACHINCO	8.2	7.6	5.8	5.4

It can be seen from Table 6 that the firms with "Champion" RENT configurations for their innovations also had good scores on all four of the "Innovation Diamond" indices. By comparison the "Shrimp" configuration firms scored poorly on the "Innovation Diamond" indices suggesting that their management of marketing, innovation, resources and strategy were less than ideal. The performance of the other innovation configuration types was more mixed. In the following sub-sections a brief analysis of each of the case study firms is outlined that provides a comparison of their size, structure, growth rate, type of innovation being commercialised and how each was found to be managing innovation.

Profiles of the "Champion" Configuration Cases

The two "Champion" cases were AIRCON from Australia and CLIMCO from France. AIRCON was a manufacturer established 11 years prior to the study by the CEO, a male entrepreneur aged in his 40's who described himself as an owner-manager. At the time of the interview the company was turning over $US 25 million annually and employing 230 people. The firm had

experienced a growth rate in its annual turn over of 23 percent and in its employee numbers of 25 percent over the three years prior to the interview. The innovation it was seeking to commercialise was a technological product that integrated within a system and substituted for an existing product already in use within its target market. This new technology was viewed as having the potential to create a new standard or system and had been generated alone. Prior to this new innovation AIRCON reported having introduced between 6 to 10 new products to markets over the previous 3 years. Around 4 percent of the firm's annual turnover was invested in R&D primarily to generate new product innovations.

CLIMCO was also a manufacturer that had only been established three years prior to the study. The CEO and founder was a male entrepreneur, also in his 40's. At time of interview the company employed 8 people and it had an annual turnover of just under $US 1 million. As a start up venture CLIMCO had experienced rapid growth over the previous 3 years. The firm's annual turnover had grown by 80 percent and its employee numbers by 57 percent. The innovation CLIMCO was seeking to commercialise was both a technological product and process which was described as integrating into a system with the ability to create a new market. However, rather than creating a new dominant design it was felt to be compatible with existing products or processes. This new technology had been created in concert with a wider network. CLIMCO, despite its relatively young age, had sought to introduce new innovations to market and reported investing 40 percent of its annual turnover in R&D principally in new product development (NPD).

Both AIRCON and CLIMCO reported having given their target markets a lot of formal consideration with respect to customer needs and the willingness of customers to adopt the new products. The two firms were also well organised in terms of how they managed their innovation with both reporting a strong involvement of both their leading customers and employees in the NPD process. They also sought to formally protect their IP rights with patents and the use of non disclosure agreements when discussing their innovations with third parties, although this latter point was stronger with AIRCON than CLIMCO. The resources available to CLIMCO were much less than for AIRCON due to its smaller size, but within their respective resource allocations they were generally similar. In the area of strategy both firms were generally well organised with formal business plans and evidence of systematic analysis of the strategic threats likely to face them as they sought to commercialise their innovations. The only difference was that CLIMCO had not given as much consideration to the likely impact of government regulation as AIRCON had.

Profiles of the "Shrimp" Configuration Cases

The two "Shrimp" configuration cases were CONSTRUCO from Australia and STRUCO from France. CONSTRUCO was a manufacturer established 25 years prior to the interview. It employed 37 people and had an annual turnover of $US 12 million. The CEO was a male entrepreneur in his 30's. Over the three years prior to the study CONSTRUCO had experienced a rapid growth rate with annual turnover growing by 43 percent and employee numbers by 47 percent. CONSTRUCO reported having introduced between 1 to 5 new innovations into markets over the previous three years and to be investing around 15 percent of its annual turnover into innovation, although it should be noted that the nature of much of these investments was not in new products, but market development innovations. The new innovation that CONSTRUCO was working on was a market development innovation, which it felt could stand alone, although it was viewed as compatible with existing systems. The new innovation was designed to substitute a competitor product and had been developed in concert with leading customers.

STRUCO from France was a construction firm established 44 years prior to the interview. It was a fairly large firm with 205 employees (both full and part time) and an annual turnover of $US 40 million. The CEO was a male executive manager and shareholder aged in his 40's. Over the previous 3 years STRUCO had experienced a modest growth in its annual turnover of 10 percent, and had seen its employee numbers fall by 2 percent. The type of innovation being considered by STRUCO was an administrative innovation that it had developed in conjunction with its key

suppliers. This innovation was designed to integrate into a system and was considered compatible with existing systems, although it could create a new market.

Compared to the two "Champion" firms, the two "Shrimp" firms had undertaken relatively little formal market assessment prior to developing their innovations. The overall innovation focus of these two firms was also low. For example, CONSTRUCO stated that the generation of new innovations was "only a little" focus for its business activity, and STRUCO did not feel that innovation was a focus for it "at all". In terms of resources, STRUCO was quite satisfied with its capacity although neither firm had explored government support programs for innovation and commercialisation or sources of venture financing. This compares to the two "Champion" firms that had both given quite a lot of consideration to government support schemes, even though both were also not particularly interested in seeking venture financing. In terms of strategy neither STRUCO nor CONSTRUCO possessed a formal written business plan. The strategic profile of STRUCO was broadly one of a compliance driven business. It did not have either a comprehensive financial or a risk management plan and had given no consideration to the reaction of its competitors. CONSTRUCO had given "only a little" consideration to the preparation of a financial analysis of its innovation and had not given any thought to potential regulatory impacts.

Profiles of the "Gadget" Configuration Cases

The Australian "Gadget" firm was FURNCO, a manufacturer established 19 years prior to the interview that employed 20 people and had an annual turnover of just under $US 2 million. The CEO of this firm was a male entrepreneur aged in his 20's. FURNCO had experience a growth in its employee numbers of 15 percent over the previous three years, and in increase in its annual turnover of 55 percent. It had a fairly strong track record in commercialisation, having introduced between 6 and 10 new products to markets during the past three years. The firm invested around 1.5 percent of its annual turnover into R&D, although not all of this went into NPD. The new innovation being launched by FURNCO was both a technological product and process which integrated into a system and was compatible with existing technologies held by customers. It was anticipated that the innovation would create a new market, and it had been developed in conjunction with a wider network.

The French "Gadget" firm was DATACO, another manufacturer that had been in existence for 14 years and employed 8 people with an annual turnover of $US 1 million. The CEO was a male shareholder aged in his 50's. Over the previous three years the annual turnover of DATACO had grown by 15 percent but its employee numbers had fallen by 13 percent. The innovation being developed by DATACO was a technological product and process able to integrate into a system, compatible with customer's existing technologies and with the potential to create a new market. It had been developed in conjunction with leading customers.

In terms of their market assessment both "Gadget" firms had quite good profiles, reflecting a systematic analysis of customer needs. While both firms also had fairly good innovation index scores, they were found to be weak in relation to their formal protection of IP rights. Their resource profiles were also quite good; however, this was not so true of their strategic behaviour. Although there was evidence of formal strategic planning taking place both firms were less positive about their performance in this regard.

Profiles of the "Joker" Configuration Cases

The Australian "Joker" configuration was PARTCO a manufacturer that had been in operation for 40 years, employed 250 people (both full and part time), and had an annual turnover of $US 34 million. The CEO was a male entrepreneur aged in his 40's who had founded the firm. Over the previous three years PARTCO had experienced a 47 percent growth in its employee numbers and an 18 percent increase in its annual turnover. As with most firms that were servicing the Australian resources sector robust growth was a pleasant challenge. Over the previous three years PARTCO had introduced in excess of 10 new innovations and invested around 4.5 percent of its annual turnover in R&D. However, much of this investment went into process technologies

rather than new products. The innovation the firm was seeking to commercialise was a technological product innovation that integrated into a system and was compatible with existing technologies used by customers. However, the new device was aimed at substituting an existing product in its target market. This new innovation had been developed in concert with leading customers.

The French "Joker" firm was AUTOCO, also a manufacturer that had been operating for 25 years. This firm was also quite large, employing 250 people and with an annual turnover of $US 55 million. The CEO was a male aged in his 30's who was described as an executive manager and shareholder. Like its Australian counterpart, AUTOCO had experienced rapid growth over the past three years. It had seen its employee numbers grow by 43 percent and its annual turnover rise by 39 percent. AUTOCO was less prolific in the generation of new products and reported only about 1 to 5 new innovations being launched in the past three years. The firm invested 5 percent of its annual turnover in R&D. The new innovation it was commercialising was a technological product and process that integrated into a system and was compatible with the existing technologies of its customers. It was anticipated that this new device would substitute existing competitor products. The innovation had been developed in conjunction with leading customers.

Both "Joker" firms had strong market orientations and also quite good innovation scores. Their resource index scores were also good, suggesting that they were fairly comfortable with the level of resources available to them for commercialisation. These firms were also strong in terms of their strategic planning activity. The "Joker" configuration has high potential sales volume and high or long length or lifecycle, however, it has a low rate or level of profitability. The two "Joker" innovations had high anticipated sales volumes and long lifecycles, but their profit margins were modest giving them low rate scores. Interestingly AUTOCO reported having "totally undertaken a comprehensive financial model" for its innovation, while PARTCO had only done this "more or less".

Profiles of the "Flash in the Pan" Configuration Cases

The "Flash in the Pan" configuration is one with high volume, low length that may or may not have high rate. FRIGCO was the Australian "Flash in the Pan" firm. A manufacturer that had been in operation for 40 years, it employed 75 people and had an annual turnover of $US 6 million. The CEO was a male aged in his 50's who was the owner-manager. Although this firm was well established, it had experienced some difficult times over the previous three years and had seen its workforce downsized by 27 percent and zero growth in its annual turnover. The firm was keen to revive its fortunes via innovation and was investing around 15 percent of its annual turnover into R&D mainly into NPD. The new innovation being developed was a technological product and process designed to create a new market. Although it was compatible with existing customer systems, the innovation could stand alone and had been developed without any outside help. The new product was viewed as having high volume and rate, but low length. The short anticipated lifecycle of this innovation was due to it being "a simple improvement of an existing process" that was "neither hard nor easy to copy" from both a technical and legal perspective. Of interest was the finding that FRIGCO had done little to protect its IP rights to the innovation. It had only undertaken tentative discussions with an IP lawyer or patent attorney and did not have patents or non-disclosure agreements in place. It is the protection of a firm's IP rights that can assist it to maintain the overall lifecycle of its innovations.

The French "Flash in the Pan" firm was SCIENCO, a manufacturer that had been in operation for 11 years, employed 55 people and had an annual turnover of $US 7 million. The CEO was a male executive manager and shareholder in his 30's. Like its Australian counterpart SCIENCO had experienced a difficult time over the previous three years. It had reduced its employee numbers by 27 percent and seen its annual turnover fall by 10 percent. The firm had a poor track record of innovation, having undertaken no previous attempts at commercialisation in the previous three years. It also invested nothing in R&D. Despite this track record the firm was now seeking to focus more on innovation and had a technological product and process that it was

planning to commercialise. This innovation integrated into a system, substituting an existing product or process, and was compatible with the existing systems of its customers. It had been developed in conjunction with its leading customers. The innovation was viewed as having high volume and rate, but low length due to it being "easy to copy" from a legal perspective and neither hard nor easy to copy from a technical perspective. It consisted of "a new arrangement of existing technologies" rather than any fundamental technological breakthrough. The firm had taken steps to put in place patents on its innovation and made use of confidentiality agreements, but it had only conducted detailed discussions with an IP lawyer "more or less" over recent years. As noted above, SCIENCO had no previous experience of commercialisation.

Profiles of the "Oasis" Configuration Cases

The "Oasis" configuration has low volume and high length, but either low or high rate. The two "Oasis" firms were OFFCO of Australia and MACHINCO of France, both of which were manufacturers. OFFCO had been in operation for 25 years. It employed 85 people and had an annual turnover of $US 8.5 million. The CEO was a male owner-manager aged in his 40's. The firm had experienced rapid growth over the previous three years, with an increase in its employee numbers of 22 percent and a 40 percent increase in its annual turnover. The firm had only a modest level of innovation activity prior to the interview and invested about 1.5 percent of its annual turnover into R&D. The innovation it was seeking to commercialise was a marketing innovation associated with a technological product and process. This device was able to integrate into a system but was viewed as having the potential to create a new market and standard or system within its target market. The innovation had been developed alone. Sales volume for the innovation was viewed as being low due to it being a niche product with modest geographic distribution. Despite this the anticipated profitability of the innovation was high.

MACHINCO was a well established business that had been in operation for 84 years. It employed 67 people and had an annual turnover of $US 12 million. The CEO was a male aged in his 50's who described himself as an "executive manager and principal shareholder". Over the previous three years the company had seen its annual turnover grow by 14 percent, but it had downsized its workforce by 4 percent. MACHINCO had only a modest number of past innovations that it had commercialised, but it invested 10 percent of its annual turnover into R&D, primarily into process innovations. The innovation being developed by the firm was a process technology that it had developed in conjunction with leading customers. The innovation stood alone and was felt to create a new standard or system. Although it was viewed as having the potential for high rate and length, the innovation was a niche process with only limited geographic and very limited market diffusion. Anticipated sales volumes were modest.

Both "Oasis" firms indicated that they could have undertaken more customer research. For example, OFFCO reported having fully researched the benefits as perceived by the customer for this innovation only "more or less" and MACHINCO had not done this at all. Although both firms had fairly good approaches to their IP rights management and claimed to have well established NPD processes, their approach to strategy was mixed. OFFCO did not have a formal business plan and had only undertaken rudimentary financial analysis of their innovation's business case. However, MACHINCO did have both a formal business plan and a comprehensive financial case analysis.

DISCUSSION OF THE FINDINGS

What do these findings tell us about the nature of innovation management in small firms? Can they provide support to the four research propositions outlined earlier in this paper? With respect to the three research questions initially raised by this study, the findings suggest that the process used by entrepreneurs from small innovator firms to undertake risk-return analysis of innovations prior to investment is often informal and unsystematic, although the more formal it can be made the more likely the final outcome will be a success. This is particularly the case in relation to the

identification of customer needs and determining how the customer will evaluate the benefits of the innovation.

The findings also show that small firms which attempt to manage their commercialisation process in a systematic way are more likely to achieve better outcomes. However, there remains a degree of confusion as to what "systematic" might mean within the context of commercialisation in small firms. For example, the two "Shrimp" firms reported having either no formal NPD process in place, or only a rudimentary one. However, while one of the "Champion" firms had a formal system of NPD, the other was only rudimentary. Further examination of this suggests that the latter (CLIMCO) was much smaller than the former (AIRCON), and it can be expected that the more established firms will develop such systems.

Measuring the impact of the relationship between the national innovation system and the success or failure of the commercialisation within the small firm is difficult to determine from the data available. The feedback from the 89 cases examined from the Australian and French samples suggests that most entrepreneurs see their environment as having an impact on their ability to successfully manage. Most are also critical of the role of government in assisting them in this commercialisation process. However, while government support in the form of direct grants for R&D and commercialisation can be highly beneficial, the main role of government is to create the most ideal conditions for entrepreneurship and innovation to emerge. This includes the provision of excellent infrastructure, keeping the cost of doing business down, maintaining the education and training systems in the country to ensure a steady availability of skilled employees, and also taking steps to enhance access for small firms into the nation's universities and other publicly funded R&D centres.

The study provides support for the first proposition in that it highlights the central role of the entrepreneurial manager who is the CEO of the firm. In each case the decision to proceed with the innovation was ultimately that of the CEO, and their leadership within the firm impacted very strongly on the innovation intensity and strategic planning undertaken. Each firm also followed a commercialisation pathway that was responding to its customers' or market's needs and success was contingent on the acceptance of the new innovation. Entrepreneurial learning involving this interaction between the firm and its customers was a strong driver of innovation, a finding that provides support for our second proposition.

All but three of the 12 cases (AIRCON, FRIGCO & OFFCO) had developed their innovation in conjunction with either leading customers or key suppliers. Only one case SCIENCO did not actively involve customers in developing its new innovations. This supports our third proposition that due to resource scarcity the small innovative firm is more likely to seek access to existing resources from within strategic networks external to the organisation rather than trying to develop them in response to opportunities. The need to assist entrepreneurs to access external networks and to develop the strategic management skills for dealing with such networks is important. Other research has suggested that Australia's small business manufacturers shun collaborative alliances out of a fear of information leakage, the desire to remain independent, a distrust of other firms or difficulties in identifying suitable partners (Dean, Holmes & Smith, 1997).

Our third proposition, that due to resource scarcity the small innovative firm is more likely to seek to secure a niche within the market than to follow a more generic positioning strategy, was also supported by the findings. Nine of the 12 case firms reported that their innovation was being targeted initially at limited or very limited market segments. The creation of a niche market opportunity has been recognised as a means of getting a new product commercialised as it enables the innovation to "cross the chasm" that typically exists between the early adopters who are frequently eager to adopt new idea or technologies, and the pragmatic mainstream customers who are harder to convince (Moore, 1996).

CONCLUSIONS

The commercialisation of new product or process technologies and the general management of innovation and NPD within small firms remains a poorly researched area of inquiry. Much attention in this regard has focused on the NPD and commercialisation practices of large firms that are well supported with resources, specialist skills, experience managers and ready access to markets. For the entrepreneurial manager of a small firm, the lack of resources, skills and managerial support combines with their lack of ready access to markets to make the process of NPD and commercialisation particularly challenging. Despite these problems the level of NPD and commercialisation of innovations within the small firms sector remains high. As this paper shows, the small firm that adopts a more systematic approach to assessing its markets, planning its strategy, marshalling its resources and protecting its IP rights, is likely to succeed. Small firms seeking to engage in innovation need to be willing to form strategic alliances with customers and suppliers, research centres and other firms in order to leverage the resources of other parties so as to make up for their own deficiencies.

Government policy makers seeking to assist small firms to commercialise their innovations should recognise that they need to take a dual track approach. At the macro level they need to ensure that there is access to quality research centres, skilled and educated workers, qualified managers, financing and communications infrastructure. The compliance cost of doing business also needs to be kept low. Governments at both national and state/provincial level can assist this by investing in state of the art telecommunications, road, rail and air transport systems, plus the education and training system. At the micro level there is a need for focused support schemes that allow small firms to access early stage seed capital for R&D and commercialisation. Marketing and business development support from skilled advisors should also be made available, along with mechanisms to facilitate firms to identify and contact strategic alliance partners. Government policy should also seek to bridge the divide between the universities and small firms, making it easier for such businesses to access university research.

The study has some limitations. It examines only two countries and the samples drawn were deliberately not randomised as there was a desire to select firms that had a strong innovation focus. Larger numbers of cases, drawn from other countries, should be gathered that will allow better international comparisons to be made. Future research should also undertake a quantitative analysis of the innovation diagnostic survey data to validate scales and assess the validity of the relationships found so far. Nevertheless, despite these limitations the study offers a window into the innovation practices of small firms and points to some benchmarks for superior management practice, enhanced policy support and future academic research.

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