

# **Characteristics of Firms that Grow from Small to Medium Size**

## Synthesis Report

Presented to the Industrial Research Assistance Program, National Research  
Council of Canada

By

Science, Innovation and Electronic Information Division, Statistics Canada

April 30, 2004

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## Executive Summary

This paper is the result of a joint project undertaken by the Science, Innovation and Electronic Information Division (SIEID), Statistics Canada and the Industrial Research Assistance Program (IRAP), National Research Council of Canada (NRC). The objective of the project is to increase the knowledge about the internal and external factors surrounding the growth of firms in that very important phase of moving from small to medium size. Available data from existing Statistics Canada's databases and qualitative data from interviews carried out with firms that have made the transition from small to medium size are analysed. In addition, statistical indicators that could be developed to measure high growth of small firms are discussed.

A secondary literature review is undertaken and an integrative model of the determinants of high growth firms is presented. Based on the model, fourteen hypotheses concerning possible determinants of high growth of small firms are tested using survey data and interview findings. The hypotheses are grouped under four sets of possible growth factors: external context growth factors; resource and capability growth factors; organizational growth factors; and managerial growth factors. Key findings are as follows:

### *External context growth factors*

- For small regional enterprises, 5.1% with 20-49 employees and 4.7% with 50-99 employees exhibit high growth (doubling the number of employees over five years).
- Regional enterprises with 20-49 and 50-49 employees both have a higher percentage and a higher number of high growth regional enterprises than medium (100-499 employees) and large (500 and more employees) regional enterprises.
- In very general terms, certain manufacturing industries have the highest percentage of small high growth firms, whereas a certain service and natural resource based industries have the highest numbers of small high growth firms.
- Both small communities and large communities can have high percentages of small high growth firms.

### *Resource and capability growth factors*

- High growth small R&D performers with 20-49 employees and 50-99 employees both have a higher average amount spent on R&D activities at the beginning of the period studied and a higher percentage increase in revenues than other types of R&D performers.
- High growth manufacturing provincial enterprises with 20-49 employees are significantly different from other types of provincial enterprises in the same size category in a number of characteristics. They have a higher percentage of innovators;

a higher percentage that applied for patents and used confidentiality agreements; a higher percentage of that used R&D tax credits; and a higher percentage that were involved in innovation collaboration.

- In very general terms, high growth manufacturing provincial enterprises with 50-99 employees are not significantly different from other growth and stable provincial enterprises in the same size category. With the exception of the percentage of world first innovators, the high growth provincial enterprises are not significantly different from growth provincial enterprises. With the exception of the percentage of world first innovators and the percentage that applied for patents, high growth provincial enterprises are not significantly different the stables ones.
- High growth manufacturing (with the exception of food processing) establishments with 20-49 employees had a significantly lower percentage that used a least one of the listed advanced technologies than growth or stable establishments, but were not significantly different from the declining establishments. High growth establishments with 50-99 employees had a significantly higher percentage using at least one of the listed advanced technologies than all other types of establishments.

#### *Organizational growth factors*

- A significantly higher percentage of high growth manufacturing (with the exception of food processing) establishments with 20-49 employees indicated that ongoing training was important than did all other types of establishments. The percentage of high growth establishments with 50-99 employees is not significantly different compared from other types of establishments.
- Indicators of organization and planning are an area for further statistical development.

#### *Managerial growth factors*

- A higher percentage of high growth manufacturing provincial enterprises with 20-49 employees indicated that developing export markets was an important factor of firm success than did other types of provincial enterprises in the same size category.
- A higher percentage of manufacturing (with the exception of food processing) establishments with 50-99 employees indicated that their primary product was sold in the US market than did other types of establishments enterprises in the same size category.
- The one factor that emerged consistently from the interviews with firms that had made the transition from small to medium size was the importance of business advice. Firms that thrived during an otherwise turbulent period largely attributed their success to previous business experience or timely business advice from outside the firm.
- Indicators of management practices, firm history, and management style an area for further statistical development.

## 1. Introduction

This paper is the result of a joint project undertaken by the Science, Innovation and Electronic Information Division (SIEID), Statistics Canada and the Industrial Research Assistance Program (IRAP), National Research Council of Canada (NRC). The work was carried out under a Memorandum of Understanding regarding the “Analysis of Growth Firms in Canada”, which includes these two agencies together with Industry Canada’s Small Business Policy Branch and the Government of Ontario’s Innovation and Business Development Branch, Ministry of Enterprise, Opportunity and Innovation. An NRC-IRAP/SIEID working group was set up to provide direction and guidance to the work and to review and discuss findings and documentation produced for the project. A list of the members of the working group and the project team is found in Appendix 1. In addition to this synthesis report, detailed statistical tables, a commissioned secondary literature review, and five working papers (to be published in the SIEID working paper series) have been prepared for the project.

The objective of the NRC-IRAP/SIEID project is to increase the knowledge about the internal and external factors surrounding the growth of firms in that very important phase of moving from small to medium size. Improving the understanding of growth factors can increase the survival rates of small firms as well as increase the numbers of medium-sized firms. Passing from small to medium-size involves difficult decisions and presents new sets of challenges for small firms. The aim is to provide a set of indicators that characterize small firms that are well-positioned to make the transition from small to medium size.

Sections 2 to 4 will outline the methodology of this report: sources of information and data (Section 2), the approach to measuring the transition from small to medium that has been adopted in this study (Section 3), and limitations of the study (Section 4). Section 5 will provide an overview of the secondary literature, focusing specifically on what growth factors have been proposed by analysts to explain the transition from small to medium. At the end of this section, an integrative model of the determinants of high growth firms will be presented.

The following sections will empirically test fourteen hypotheses using survey data and interview findings. The hypotheses are regrouped under the following sets of possible determinants of high growth as outlined in the model presented in Section 5: external context growth factors (Section 6), resource and capability growth factors (Section 7), organizational growth factors (Section 8), and managerial growth factors (Section 9). The hypotheses to be tested are ones that are suggested in the secondary literature review on possible growth factors. The selection of the hypotheses was also determined by the availability of data from the surveys and from the findings from the interviews.

Section 10 will examine the issue of growth as it relates to different types of firms. A taxonomy of firm archetypes will be presented and discussed. Finally, the report will conclude with a discussion of what has been learned about indicators of the transition

from small to medium and how a set of key indicators of firms positioned to grow from small to medium might be developed.

## **2. Sources of information and data**

The project involved three separate sets of activities, the results of which are presented in this report.

### *1. Secondary literature review*

An extensive literature review was conducted on the factors related to the small-to-medium transition. A report was commissioned from Tomas Bas, researcher at UQAM, who analysed the transition factors in the context of the “Theory of Competencies”. In addition, staff from both NRC-IRAP and SIEID, reviewed and analysed available secondary literature. The results of this secondary literature review are presented in the first section of the report.

### *2. Analysis of existing Statistics Canada databases*

No single data source exists in Statistics Canada that can provide a comprehensive set of indicators on the transition from small to medium firms. However, Statistics Canada does hold several databases that can provide useful insights on the issue.

Four Statistics Canada databases are analysed in this report including three that have been developed by SIEID. As the objective of SIEID’s program is to develop and present of coherent picture of technological and related organizational change in Canadian institutions, SIEID databases are particularly well-suited to investigate the issues of firms that are technology based. The SIEID surveys probe issues related to R&D, innovation and the use of advanced technologies and practices. The four databases to be analysed in this report are the following.

- The *Survey of Innovation 1999*, carried out by SIEID, surveyed manufacturing firms with at least 20 employees and at least \$250,000 in revenues. The survey provides data not only on innovation in firms but also on many other factors that could be related to firm growth including performance of R&D, engagement in collaborative innovation activities and the use government support programs. Data from the Survey of Innovation 1999 has been linked to the Annual Survey of Manufacturers for 1997 and 1999 and growth of firms has been analysed over this period.
- The *Research and Development in Canadian Industry (RDCI)* database brings together survey data and administrative data on all R&D performers in Canada. It collects data on R&D expenditures, R&D personnel, sources of funds, as well as other issues. Data collection has been carried out

since the late 1960's. Analysis will be done on the five year period from 1995 to 2000.

- The *Longitudinal Employment Analysis Program- Small Area File (LEAP-SAF)* contains data based on tax records of companies and their employees. Annual data are available since 1983. Although the data are at a moderate level of industrial detail (3-digit SIC), they are geographically detailed. Analysis will be done for the five year period from 1995 to 2000.
- The *Survey of Advanced Technology in Canadian Manufacturing 1998* surveyed manufacturing firms (except for food processing industries) that have at least 10 employees. Firms were asked if they used or planned to use a set of advanced technologies and practices. The survey data has been linked to the Annual Survey of Manufacturers for 1995 and 1998 and growth of firms has been analysed over this period.

For more details on each database, see *Appendix 2: Methodological Notes* at the end of this report.

### *3. Interviews*

Interviews were carried out with 25 firms from across Canada in Montreal, Ottawa, Toronto, Brockville (Ontario) and Vancouver with a view to determining what factors were determinant in their transition from small to medium. One of the firms interviewed was one that had failed.

## **3. The approach to measuring the transition from small to medium**

The approach to measuring the transition from small to medium that has been adopted in this study involved two separate approaches that will be presented separately in this section: the analysis of the quantitative data and the use of interviews to collect qualitative data.

### **3.1 The analysis of quantitative data**

The study has analysed data from four different Statistics Canada databases. In order to assure to assure the maximum degree of comparability between these databases, definitions of key concepts were developed and were used in the analysis of each database. The limitations of this approach for both the quantitative data and the qualitative data are discussed in detail in the following section.

### *The definition of high growth firms*

The term “gazelles” is often used to describe firms that at least double their number of employees or revenues over a five-year period. The use of this definition was considered in defining high growth firms, however, as the analysis of the data proceeded, it became clear that the characteristics of firms that at least doubled the number of employees and those that at least doubled their revenues were different. The decision was made to analyse only those firms that at least doubled the number of employees.

Another important criteria in the definition of high growth is the issue of the growth of firms with less than 20 employees. As the doubling of the number of employees in very small firms was not considered to be a significant indicator of growth, it was decided to add an additional criteria of growth. In addition to doubling the number of employees, firms had to increase their number of employees to at least 20. Thus, for example firms that double from one employee to two employees or two to four employees are not considered to be high growth firms. A special category was created for these firms called “micro-high growth firms”. In this category are all firms with between 1 and 9 employees at the beginning of the reference period which doubled the number of employees but did not increase this number to more than 20.

The definition of high-growth firms used in this study is thus the following:

**High growth firms are firms that at least doubled the number of employees in five years and at the end of the five years have at least 20 employees.**

### *Firm-size categories*

The following size categories were adopted in consultation with NRC-IRAP. As the focus of the study is high-growth small firms, the small firm category was broken down into three sub-categories. Analysis of the data, depending on the availability of data, uses the following size categories.

<b>Small firms</b>	1-99 employees
	<i>1-19 employees</i> <i>20-49 employees</i> <i>50-99 employees</i>
<b>Medium firms</b>	100-499 employees
<b>Large firms</b>	500 + employees

In the statistical tables that were produced for the project, data are available for the various size categories.

### *Types of growth*

Firms have been classified according to the growth in the number of employees over a five year period as follows:

<b>High growth firms</b>	Firms that at least doubled the number of employees and passed the 20 employee threshold
<b>Micro high growth firms</b>	Firms that doubled the number of employees and did not pass the 20 employee threshold
<b>Growers</b>	Firms that increased the number of employees by at least 20% and by less than 100%
<b>Stable firms</b>	Firms that remained within 20% of their employment from the start of the reference period
<b>Decliners</b>	Firms that decreased their employment by more than 20% from the start of the reference period
<b>Dead/unmatched</b>	Firms that did not exist at the end of the five years. In the case of the RDCI, firms that were dead or did not perform R&D at the end of the period

When five years of data are available, growth in the number of employees is measured over this five year period. When the survey data is available only for more limited period of time, the criteria for growth is pro-rated. For details on the pro-rating see *Appendix 2: Methodological Notes* at the end of this report.

### *Searching for the determinants of high growth in small firms*

The objective of the project is to identify the characteristics of firms that are poised to grow from small to medium. The approach taken in this synthesis report is the following: identify all small firms at the beginning of a five year period and then compare the characteristics of firms that have at least doubled the number of employees over the five year period and passed the 20 employee threshold with firms with the other types of firms (growers, stable firms, and decliners). Characteristics that are significantly different in the high growth firms from the other types of firms will be considered to be growth factors.

Concerning the specific issue of the transition from small to medium, small firms that, at the beginning of the period have 50-99 employees, at the end of the period will all be medium sized firms. When they at least doubled, they will have 100 or more employees. The analysis could have been restricted to this size category. The approach that has been adopted also includes the analysis of firms with 20-49 employees that at least doubled the number of employees. In this size categories, some of the firms, when they at least doubled, might become medium size firms, i.e. might increase the number of employees to 100 or more, whereas other will not have increased to 100 or more employees. This approach was adopted because it has the added advantage of allowing for an analysis of whether growth factors for small firms with 20-49 employees are different from the growth factors for small firms with 50-49 employees.

### **3.2 The use of interviews to collect qualitative data**

Twenty-five firms were interviewed from different industries and in different locations. Using available Statistics Canada databases, high growth firms, that had completed the transition from small to medium-sized firm were identified. Prior to the interview, firms were provided with a “respondent sheet” that explained that Statistics Canada had been asked by NRC-IRAP to undertake a study to determine the characteristics of firms that grow from small to medium. An overview of the interview was also included in the respondent sheet with the assurance that all details from the interview would be kept confidential by Statistics Canada. Respondents were visited at their place of business by two members of the SIEID project team. Each interview lasted approximately one hour.

The purpose of the interview was to obtain the view of the senior managers of high growth firms on the internal and external factors that were important to the growth of their firm from small to medium size. The structure of the interview was as follows:

- The senior manager was first asked to describe their firm’s beginnings and the important milestones in its growth.
- Specific questions were asked about the factors that were critical to the firm’s growth from small to medium.
- The senior manager was asked to discuss the barriers to growth that the firm had to overcome in order to get to its current size.
- Finally, the senior manager was asked to suggest any critical growth factors that were not already discussed.

An interview guide was prepared for the interviewers. The interviewer guide contained very general questions related to the four above-listed items and an accompanying list of possible prompt questions. Concerning the specific transition factors, the senior manager was asked if the following factors were of relevance to the transition: R&D, innovation, intellectual property, ownership/management, human resources, business strategy, and external factors (including economic environment, the market, sources of funding and sources of information). Extensive notes were taken by the interviewers and a confidential interview report was prepared for each interview. The interviews provide for a rich source of qualitative information on small firms that have made the transition to medium sized firms.

### **4. Limitations of the Study**

This study is exploratory in nature. The approach has been to mine databases that already exist at Statistics Canada and to carry out interviews. Because of the exploratory nature of this study, there are a number of limitations that need to be taken into consideration when interpreting the findings presented.

- *Different statistical units.* The various surveys that are analysed in this paper have different statistical units. As a result, findings from the various surveys are

not strictly speaking comparable. For example, the statistical unit of LEAP-SAF is a regional enterprise, whereas the statistical unit for the RDCI is an enterprise. A glossary at the end of the report defines the key terms that are used in the report and Appendix 2 provides an overview of the methodology for each survey.

- *Different time frames.* The period covered by the different surveys varies. This study analyses the data for the most recent period available for each survey. Where there are surveys that are carried out on an annual basis, such as the RDCI and LEAP-SAF, it is possible to analyse the growth of firms over a five year period. In the case of surveys that are carried out on an occasional basis such as the Survey of Innovation 1999 and the Survey of Advanced Technologies in Canadian Manufacturing 1998, a five year period is not available. Data from the Annual Survey of Manufacturers has been linked to each of these surveys for the reference year that the survey was carried out and for two or three years prior to the reference year.
- *The historical context of the period surveyed.* The data available covers, for the most part, the period 1995 to 2000. This is a period of sustained economic growth. Had the period of time analysed been different, it is quite possible that the findings would vary. During certain periods of high growth in the economy, there would likely be more high growth firms, whereas when the economy slows down there would likely be fewer high growth firms. Growth of firms in different industries might vary as well. The only way to control for the general effect of the historical context of the period surveyed would be to carry on a continuing program of the analysis of the growth of firms. Such a program is beyond the scope of this study. The study is thus constrained by the period of time of the databases that are currently available and the selected periods under study.
- *The selective nature of the quantitative indicators.* This study “mines” existing data. The data that is currently available and that is being analysed was not collected with the specific objective of providing for the analysis of high growth firms and is thus highly selective. The interviews that were carried out are an attempt to go beyond currently available data. The interviews provide insight on what other factors, that are not yet measured, could be critical for high growth firms. A discussion of the development of other possible quantitative indicators will be done at the end of this report.
- *Different measures of employees:* The different surveys have different measures of employees. For example, the unit measurement of employees in LEAP-SAF is Individual Labour Units (ILU) whereas, for the RDCI, it is average number of employees in the reference year. Care should thus be taken in comparing the findings from the different surveys. Definitions of the different employment measures are found in the glossary at the end of this report.
- *Limitations of the interviews.* Twenty-five interviews were carried out. An attempt was made to select firms in different industries and in different

geographical locations. However, it is evident that with only 25 interviews, it is not possible to sample all types of firms and all types of circumstances.

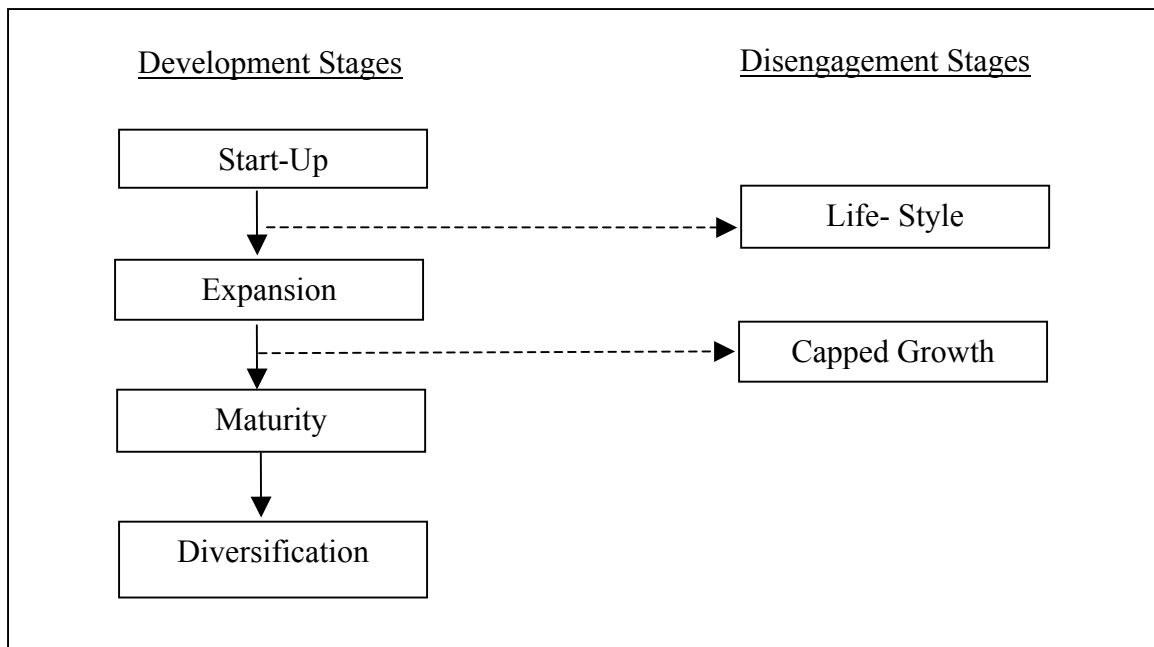
## 5. Overview of the secondary literature

This section will provide an overview of the secondary literature that addresses the issue of the factors that contribute to the growth of firms. Growth factors that are considered to be relevant to the transition of firms from small to medium will be identified. This section will end with a model of the determinants of high growth firms.

### 5.1 Theories of stages of growth

McMahon (1998), in his extensive review of the secondary literature of models of SME's growth, argues that the work of Hanks and his colleagues represent one of the most methodologically and conceptually interesting approaches to the issue of the stages of enterprise life-cycle, based on an empirical analysis of "high technology industries" in the USA. The enterprise life-cycle suggested by Hank's work is presented in Figure 1.

**Figure 1: Enterprise Life-Cycle Model**



Source: Adapted by authors from McMahon (1998)

According to this model of the enterprise life-cycle, important changes occur to firms as their size increases. The focus of the analysis is on changes to the firm's organizational structure.

A small firm (start-up and expansion) is characterized by simple organizational structures with a limited number of organizational levels. There is, within the organization of the

small firm little functional specialisation. Its organization is highly centralized and quite informal.

When firms are at the expansion and maturity stage, organizational structures are more complex with a larger number of organizational levels. Centralization of control of the firm declines and formalization increases. There are more specialized functions. When the firms are at the “diversification” stage, there is a growing tendency to increase the number of divisions in the firm and the number of organizational levels. The large firm also has more specialized functions.

Whereas the life-cycle of the enterprise can be seen a progression from smaller to larger firms, Hanks et. al. point out that firms can, in effect, disengage from the growth trajectory of the life cycle. In other words, they can achieve a stable and sustainable size. What characterises these types of firms is that they exhibit no growth in employment.

In the case of firms that opt for the “life-style” stage, they tend to be slightly larger than enterprises in the start-up phase but are organizationally similar to enterprises in the start-up phase. Why a firm would choose this option might be the deliberate choice of the small business managers or it could be the limited nature of the enterprise’s market.

In the “capped growth” phase, firms are slightly larger than those in the expansion stage. They are generally older and have an organizational structure that is less complex. These are firms that have disengaged from the growth process after successfully expanding from the start-up phase and continue to show no increase in employment over time.

The life-cycle model of Hanks et. al., according to McMahon, provides for a solid conceptual framework on which to base empirical analysis. The secondary literature suggests other types of issues that need to be further developed. The model does not address the issue of the decline and death of firms. Another issue that is discussed in the secondary literature is whether the transition processes from one stage to another is incremental or radical. When a small firm grows from small to medium, for example, does it proceed in a slow step-by-step steady manner, or is the change disruptive requiring a radical transformation or “gestalt” shift in the organization?

The above model of the enterprise life cycle suggests two important aspects of the transition from small to medium firm.

- **Organizational transformation:** One should expect to see the transformation of the organizational structures of firms that are moving from small to medium. Organizational structures that are informal and centralized should be moving to structures that are the more formal and more decentralized. The number of organizational reporting levels should be increasing and more complex specialized functions should be emerging.
- **Small firms that don’t grow:** According to the enterprise life cycle model, one should not expect all small firms to grow to medium sized firms. The literature

shows that small firms do not have to grow in order to become viable and sustainable business operations. This is the case of life style enterprises or capped growth firms. In the development of indicators of the transition from small to medium, it will be important to identify indicators of firms that are not likely to grow vs. those that are poised to grow either through a deliberate strategy or not.

## **5.2 Theory of competencies as an explanation of differential growth of firms**

The resource-based theory of growth views the firm's internal capabilities as directly connected to growth. This position is in sharp contrast to the neo-classical economic assumption that if firms are identical, their environment is the same, and if information is free and equally accessible, they will act in the same manner and the growth in those firms will be similar.<sup>1</sup>

According to the theory of competencies, the competitive advantage of a firm depends upon its internal capabilities or competencies, both tangible and intangible, which allow the firm to differentiate itself from its competitors. Intangible resources, such as intellectual capital, routines, know-how, alliances, access to capital, etc., are of particular importance. Competencies of most value are those that are difficult to copy or transfer or are protected by intellectual property methods, such as patents. Thus, in an environment where there is competition between similar firms, firms that are able to differentiate themselves from others, based on their competencies, should perform better.

### *Alliances as a growth factor*

A strategic alliance can reduce risk, decrease the cost of R&D, and facilitate access to markets by providing access to complementary competencies that the firm may not have. Both partners are strengthened through the combination of competencies and joint learning and through the development of new competencies that can occur because of the strategic alliances.

When SME's enter into alliances, they often bring intellectual capital and patents. The larger firms are likely to bring experience, established markets, better physical and financial infrastructures, or superior marketing capabilities. The impact on both firms is to accelerate their growth.

### *Firm age and the impact of intellectual capital as a growth factor*

Technological learning, knowledge building, and the development of intellectual capital takes time. Age is, thus, a critical factor for firm growth. The knowledge base of the firm can be considered as the intellectual capital of the firm. Intellectual capital must be identified, created and managed within the firm if the firm is to make effective use of these resources and capabilities.

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<sup>1</sup> This sub-section is based on a secondary literature review of the theory of competencies prepared by Tomas Bas that was commissioned as part of the project.

In general terms, firms with experience in a niche market and which are endowed with high quality intellectual capital have less difficulty in identifying their knowledge needs. The development of both internal and external communication channels or networks over time are critical for the development of the competencies of the firms and for its growth.

#### *Intellectual property as a growth factor*

Firm success (and growth) will result when the firm, over time, can create a monopolistic position with its products or services. The ability to formally protect the firm's intellectual property is a key factor for growth. Protection can take place in a number of different ways including patents, trade secrets, copyrights, trademarks, etc. as well as through more informal methods such as confidentiality agreements.

#### *Firm financing as a growth factor*

According to the theory of competences, firms that can acquire venture capital in the early stages of their development are the most likely to grow. There are a number of different stages of venture capital from seed funding to determine the feasibility of the product to start-up capital which allows the firm to set up operations to early growth venture capital which ensures the financing in the critical first two or three years of the firm. Firms with the capability to access sources of financing are likely to grow faster than those without.

#### *The issue of geographical location*

Concerning the issue of the importance of the geographical concentration of firms, the theory of competencies does not have a clear-cut position. More research is considered to be needed on the topic to see the possible impact of this particular factor. Both a global and local perspective would need to be considered in any such research. Financial and intellectual competencies can be concentrated in certain geographical location, particularly in large cities, but it is not clear if such factors are critical to the growth or success of firms.

The theory of competencies, thus, points to a number of factors which might explain why some firms grow at faster rates than others. Adopting this perspective, indicators for the firms that are poised to make the transition from small to medium should include indicators of a set of critical competencies. One would therefore expect to be able to observe that firms that grow from small to medium have the following characteristics:

**Alliances:** Small firms that exhibit high growth will be more connected to external partners.

**Building intellectual capital:** Small firms that exhibit high growth will be proactively developing their human resource capability.

**Protecting intellectual property:** Small firms that exhibit high growth will be increasing the protection of their intellectual property.

**Increased access to external financial resources:** Small firms that exhibit high growth will be the ones that are increasing their financial resources from external sources.

### 5.3 The strategic perspective

Teece and Pisano (1994) add the strategic dimension to the issue of “competences” that was discussed in the previous section. While acknowledging the importance a “resource-based strategy” to develop technology assets and to protect intellectual property, they argue that in order for firms to compete effectively, they need to develop “dynamic capabilities”.

The word “dynamic” refers to the shifting character of the environment; certain strategic responses are required when time-to-market and timing is critical, the pace of innovation is accelerating, and the nature of future competition and markets is difficult to determine. The term “capabilities” emphasizes the key role of strategic management in appropriately adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competences toward changing environment. (Teece and Pisano, 1994, p.538)

To understand the strategic dimensions of a firm, they argue that one needs to analyse three different classes of factors: organizational and managerial processes, firm position, and paths or strategic alternatives available to the firm.

*Organizational and managerial processes* of the firm refer to the way that things are done in the firm. Three important dynamic capabilities are critical for firm success: integration, learning and reconfiguration/transformation. The firm’s capability to coordinate and integrate activities within the firm as well as outside the firm provides it with strategic advantage. The firm’s ability to learn is also critical. Learning involves organizational as well as individual skills. To be effective learning must lead to new patterns of activities, routines or a new “logic of organization”. The firm, when it is in a rapidly changing environment, must be able to reconfigure its structure, both internally and externally.

*The position* of the firm refers to the current endowment of the technology and intellectual property, as well as the client base and the upstream relations with suppliers. The position of the firm is related to its business assets- specifically to the difficult-to-trade knowledge assets and the assets that are complementary to them such as its reputation and its relational assets. These assets can be technological assets, complementary assets, financial assets and locational assets (the geographical location of the firm can provide it with competitive advantage). The more difficult the assets are to replicate, the more they provide strategic advantage to the firm.

*Paths* refer to the strategic alternatives that are available to the firms. A firm's options are not infinite. Rather its options are path dependent, based on its business assets, its dynamic capabilities, the history of the firm, and the technological opportunities that are available.

From the strategic perspective, it is not enough for a firm to be endowed with a set of competences to be successful, it must also be endowed with dynamic capabilities. In the transition from small to medium, the following dynamic capabilities are critical:

**The ability to integrate, learn, reconfigure/transform firm activities:**

Significant changes to the organizational structures and activities are required to respond to a changing environment and to mobilize firm resources for targeted activities.

**The development of unique, difficult to replicate competencies:** Competitive advantages accrue when firms can do things that competing firms cannot do.

**Exploitation of technological opportunities:** There is the need within the firm to recognize technological opportunities and then to restructure itself to address these opportunities.

#### **5.4 A focus on management factors**

In 2002, the RBC Financial Group, the Canadian Manufacturers & Exporters and the Canadian Federation of Independent Business commissioned a study from the Queen's School of Business. The objective of this study was to bring together research on SME management and growth and to suggest strategies for dealing with internal barriers to growth. (Queen's School of Business, 2003)

The resulting study concluded that many Canadian firms with growth potential often lack the organizational and leadership skills to respond to the business challenges they face. The report lists internal management challenges that the SME's need to address if they are to grow to the next stage.

*Strategy for growth:* It is not enough for an SME to have a strategic plan. SME's need action plans to ensure effective follow through and these plans need to be updated on a regular basis in order to adapt to changing circumstances. These action plans identify what is to be done, who will do the activities, and when the activities will be done.

*Managing financing:* SME managers need to promote their firms to a wide-array of possible financing institutions. SME managers need to understand the perspective of the financiers and prepare presentations and business plans that target the financier's interests. It is particularly important for the firm's financing to go beyond the "3f's" (family, friends and fools).

*Creating external networks and market connectivity:* SME's need to be connected to suppliers, markets, financiers, competitors, advisors and colleagues in order to gain momentum.

*Upgrading management skills and capabilities:* Growing from a start-up requires some turn-over of key personnel or alternatively retraining of staff to learn the management skills required of the next growth stage. Thus, going beyond the current capabilities of the firms can be done through training and development or by hiring new employees.

*Challenging the leader's assumptions:* The founders of a company can become too focused on the needs of their present growth stage. They need the perspective of outside advisors to see where the firm is headed. These advisors provide advice on how to make the transition to the next stage. Outside advisors both challenge the view point of the founders and can bring knowledge into the firm of markets and opportunities.

*Managing succession and exits:* As the firm becomes larger and older, succession planning becomes critical. This can involve passing the company to the next generation, selling it, or letting go of responsibility and authority.

*Growth and organizational change:* The transition from small to medium requires considerable organizational changes. This transformation needs to be carefully planned and managed to ensure that organizational inertia does not set in. The clarification of roles and responsibilities of staff is critical as the transformation takes place.

*Professionalizing the business infrastructure:* Formal structures need to replace informal structures as the firm grows. This allows for the delegation of responsibility. New specialized skill sets need to be introduced into the firm.

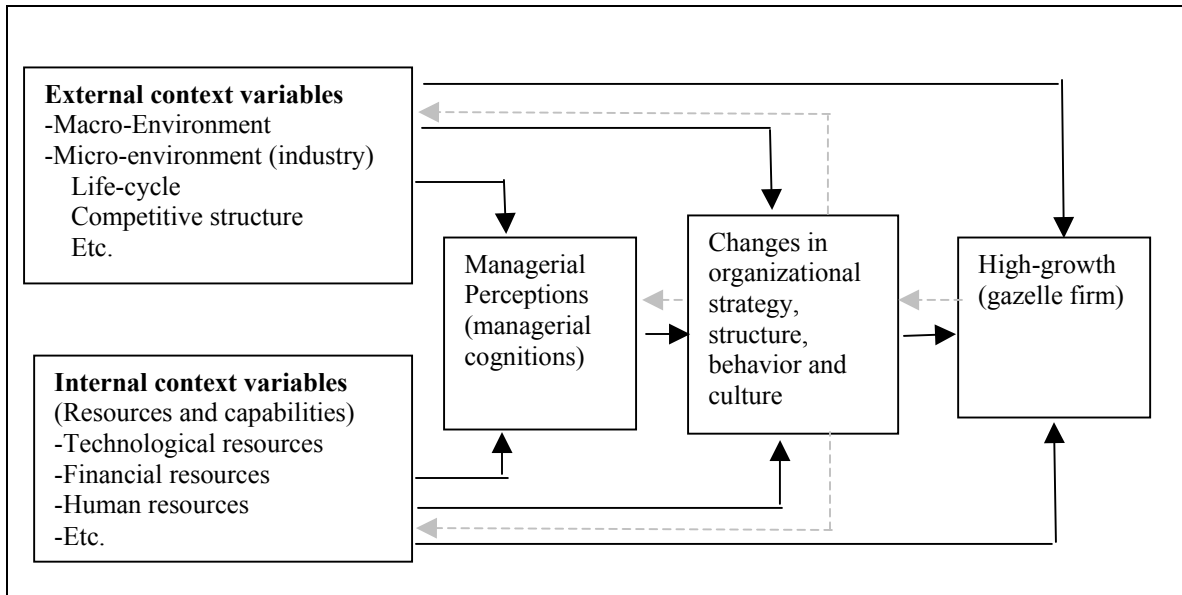
*Maintaining organizational culture and values:* Effort needs to be expended to develop values that are shared by all employees and new recruits. These values enable rapid decision-making regarding new opportunities.

Thus, a number of very detailed and specific transformations have been identified within the firm that need to take place for firms to make the transition from small to medium. In very general terms these changes involve the following: developing a strategy for growth; transforming human resources; transforming organizational structures and culture; and ensuring the financing of growth.

## 5.5 A model of the determinants of high-growth firms

The contribution of Moreno and Castillas (2002) is a synthesis of different theoretical streams of literature and the development of an integrative model of high growth firms. The model below (Figure 2) integrates a number of different theoretical perspectives, some of which have been discussed in previous section of this report.

**Figure 2: Determinants of the High Growth Model**



Source: Moreno and Casillas (2002), p.5

In this model, high growth in a firm occurs as a result of the strategic fit or adjustment process between the company and its environment. This process can be a proactive growth process or it can be a reactive process to favourable changes in the internal and external environmental condition. The model thus incorporates four levels of analysis to explain the high growth of firms: the general environment of the firms, the internal resources and capability of the firm, perceptions of the managers, and the changes to organizational strategy, structures, behaviour and culture. The model also incorporates feedback flows. For example, changes in the firm's strategy, structures, behaviour and culture can modify the internal and external environment.

When the process is proactive, the growth process is deliberate and conscious and involves strategic planning of the firm. The owner-managers assess external opportunities and internal strengths of their firms, find an opportunity, and then undertake the strategic reorientation of their firms which is likely to involve radical change in the organizational strategy, structure, behaviour and culture of the firm.

When the process is reactive, the growth is a result, not of the anticipatory attitude of the owner-managers, but rather a direct consequence of internal or external conditions of the

firm or of non-deliberate (unplanned) changes in the strategy, structure, behaviour or culture of the firm.

Moreno and Casillas (2002) stress the importance of analysing owner-managers as a key determinant of the high growth of firms. They draw on the literature on entrepreneurship. According to them, high growth cannot be understood without understanding the capacity to identify and exploit opportunities and this is what the owner-managers contribute. This capability can be called “entrepreneurial capability”. Of particular importance is the managerial mindset and cognitive structure of the top management team of the firm.

The following sections will propose a series of testable hypothesis for possible growth factors that are determinant in the transition from small to medium. Consistent with the model, hypotheses will be proposed for external context growth factors (Section 3), resource and capability growth factors (Section 4), organizational growth factors (Section 5), and managerial growth factors (Section 6). The approach in each section will be the same. For each hypothesis, quantitative findings from the survey data, when available, will be presented which either supports the hypothesis or not, followed by qualitative findings from the interviews.

## **6. External context growth factors**

This chapter will look at three hypotheses related to possible external determinants of high growth firms: the size of the firm, the industry of the firm, and the geographical location of the firm.

*Hypothesis #1: There will be more smaller high grow firms than large high growth firms*

The LEAP-SAF data provides a broad overview of where high growth firms are located throughout the economy<sup>2</sup>. Table 1 shows that most high-growth regional enterprises are small. Of the approximately 16,000 regional enterprises that exhibit high growth between 1995 and 2000, 72% of them were in the size category of 1-19 employees. These are small regional enterprises<sup>3</sup> that in 1995 had from 1-19 employees and by 2000 had at least doubled the number of employees and had increased their size to 20 employees or more. The number of high growth regional enterprises decreases as the size category increases.

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<sup>2</sup> It should be noted that the LEAP-SAF database includes public sector organizations as well as private sector firms.

<sup>3</sup> Definitions of statistical terms used in the report are found in the Glossary at the end of the report.

Table 1 also shows that, with the exception of the size category 1-19, the percentage of high growth regional enterprises in each size category decreases as the size of the regional enterprises increases. Five percent (5.1%) of firms with 20-49 employees are high growth regional enterprises compared to 2.9% for regional enterprise with than 500 employees or more.

**Table 1: High Growth Regional Enterprises by Size Category, 1995 to 2000**

<b>Starting Size Class in 1995</b>	<b>Number of High Growth Regional Enterprises</b>	<b>Percentage of High Growth Regional Enterprises</b>	<b>Percentage of Deaths of Regional Enterprises</b>
1-19 ILUs	11,464	1.1%	52.6%
20-49	2961	5.1%	24.8%
50-99	952	4.7%	21.4%
<i>All small (1-99)</i>	<i>15,377</i>	<i>1.4%</i>	<i>50.5%</i>
100-499	556	3.9%	18.4%
500 +	72	2.9%	11.5%
<b>Total</b>	<b>16,005</b>	<b>1.4%</b>	<b>50.0%</b>

Source: Statistics Canada, LEAP-SAF

It is interesting to note that very small regional enterprises (1-19 employees) have a much higher death rate than regional enterprises in the larger size categories. Approximately 50% of regional enterprises with 1-19 employees in 1995 had died by 2000. This compares with the death of 11.5% of regional enterprises with 500 or more employees over the same period of time.

The findings from the LEAP-SAF database show that, regardless of the size category, high growth regional enterprises are relatively rare phenomena. For small regional enterprises, 5.1% with 20-49 employees and 4.7% with 50-99 employees exhibit high growth. Very few regional enterprises in the economy as a whole, exhibit high growth, regardless of their size. Only 1.4% of all regional enterprises exhibit high growth.

*Hypothesis #2: High growth small firms will be concentrated in certain industries*

LEAP-SAF data show that the percentage of high growth in small regional enterprises (1-99) varies by industry (Table 2). The highest percentage of high growth regional enterprises are found in the Plastics products industry, the Electronic electronics products and the Primary metal industries. All industries in the list of the top 10 industry groups, by percentage of high growth regional enterprises, are manufacturing industries.

**Table 2: Percentage of Small (1-99 ILUs) High Growth Regional Enterprises, by Top 10 Industry Groups, 1995 to 2000<sup>4</sup>**

<b>Industry Group</b>	<b>Percentage of Small High Growth Regional Enterprises</b>	<b>Number of Small High Growth Regional Enterprises</b>
Plastics products industry	6.9%	159
Electrical electronics products	5.9%	199
Primary metal industries	5.3%	53
Transportation equipment industries	5.2%	171
Furniture fixture industries	5.1%	165
Wood industries	5.0%	338
Paper and allied products	5.0%	69
Machinery industry	4.5%	205
Fabricated metal products	4.2%	447
Primary textile industries	4.0%	13

Source: Statistics Canada, LEAP-SAF

<sup>4</sup> Industry comparison in Tables 2 and 3 is based on SIC (Standard Industrial Classification) industry groups. Industry groups 1-3 have been disaggregated into 2-digit industries. The total number of small high growth provincial enterprises at the industry group level are as follows: Group 1: Primary industries- 755; Group 2: Base manufacturing- 1,469; and Group 3: Secondary manufacturing- 1,449.

Table 3 shows the top 10 industry groups in terms of the number of small high growth regional enterprises. Industry groups with the largest number of small high growth regional enterprises are: Wholesale and retail trade, Services, and Accommodation, food and beverages. This list is dominated by service industry groups and industries related to natural resources (some of which are manufacturing industries).

**Table 3: Number of Small (1-99 ILUs) High Growth Regional Enterprises, by the Top 10 Industry Groups, 1995 to 2000**

<b>Industry Group</b>	<b>Number of Small High Growth Regional Enterprises</b>	<b>Percentage of Small High Growth Regional Enterprises</b>
Wholesale and retail trade	3,058	1.3%
Services	2,566	1.5%
Accommodation, food and beverages	2,472	1.1%
Construction, transportation and utilities	2,379	1.4%
Government services	1,206	1.3%
Fabricated metals	447	4.2%
Wood industries	338	5.0%
Agriculture	286	0.5%
Food industries	259	3.9%
Other manufactured product industries	218	3.1%

Source: Statistics Canada, LEAP-SAF

*Hypothesis #3: High growth small firms will be concentrated in certain geographical locations*

There has been considerable debate among researchers and policy analysts on the importance of geographical location to the success of firms. Proponents of “clusters”<sup>5</sup> argue that firms will thrive in an environment where there are a concentration of their suppliers, competitors and support organizations. According to this perspective, one would expect that high growth firms, including small ones, are more likely to be located in larger cities where resources for the firms would be concentrated.

<sup>5</sup> For further information on the theory of clusters see de la Mothe and Paquet (1998) and Porter (1998)

Data from the LEAP-SAF does not support this hypothesis. The list of the top 15 communities that have a high percentage of small high growth regional enterprises (Table 4) includes small communities such as Yellowknife and Wood Buffalo as well as large communities such as Ottawa-Hull and Toronto.

**Table 4: Percentage of Small (1-99) High Growth Regional Enterprises, by Top 15 Communities, 1995 to 2000**

<b>Community</b>	<b>Percentage of Small High Growth Regional Enterprises</b>	<b>Number of Small High Growth Regional Enterprises</b>
Yellowknife, NWT	3.41%	26
Wood Buffalo, Alberta	3.04%	50
Saint-Georges, Quebec	2.78%	43
Chatham, Ontario	2.53%	46
Grand Prairie, Alberta	2.47%	56
Kitchener, Ontario	2.36%	295
Leamington, Ontario	2.36%	38
Guelph, Ontario	2.23%	85
Fort St. John, British Columbia	2.19%	27
Calgary, Alberta	2.18%	779
Halifax, Nova Scotia	2.11%	236
Oshawa, Ontario	2.08%	142
Sherbrooke, Quebec	2.02%	120
Ottawa-Hull, Ontario/Quebec	2.04%	523
Toronto, Ontario	2.00%	2,613

Source: Statistics Canada, LEAP-SAF

### *Summary of Section 6*

The findings from the LEAP-SAF database support the following conclusions relative to the question of external context growth factors.

- Based on the analysis of the LEAP-SAF database, regional enterprises with 20-49 and 50-49 employees have both a higher percentage and a higher number of high growth regional enterprises than medium (100-499 employees) and large (500 and more employees) regional enterprises. Small firms also have a lower survival rate, particularly those with between 1 and 19 employees.
- Based on the analysis of the LEAP-SAF database, there are significant differences between industry groups in terms of both the percentage and numbers of small high growth regional enterprises. In very general terms, certain manufacturing industry groups have the highest percentage of small high growth firms, whereas a certain service and natural resource based industry groups have the highest numbers of small high growth firms.

- Based on the analysis of the LEAP-SAF, both small communities and large communities can have high percentages of small high growth firms.

## **7. Resources and capabilities growth factors**

This section will look at the firm resources and capabilities as possible determinants of high growth in small firms. Four hypotheses related to the internal resources and capabilities<sup>6</sup> will be examined: R&D, innovation, advanced technology acquisition, and protection of intellectual property, as well as two hypotheses related to the external relations of the firm: access to external financial resources and collaboration with other partners.

Two of the databases that will be analysed in this section, the *Survey of Innovation 1999* and the *Survey of Advanced Technology in Canadian Manufacturing 1998*, contain data only on manufacturing industries so much of the analysis will be relevant only to the manufacturing industries. Data from the *Survey of Research and Development in Canadian Industry* will also be analysed and it allows for the analysis of manufacturing as well as other industries.

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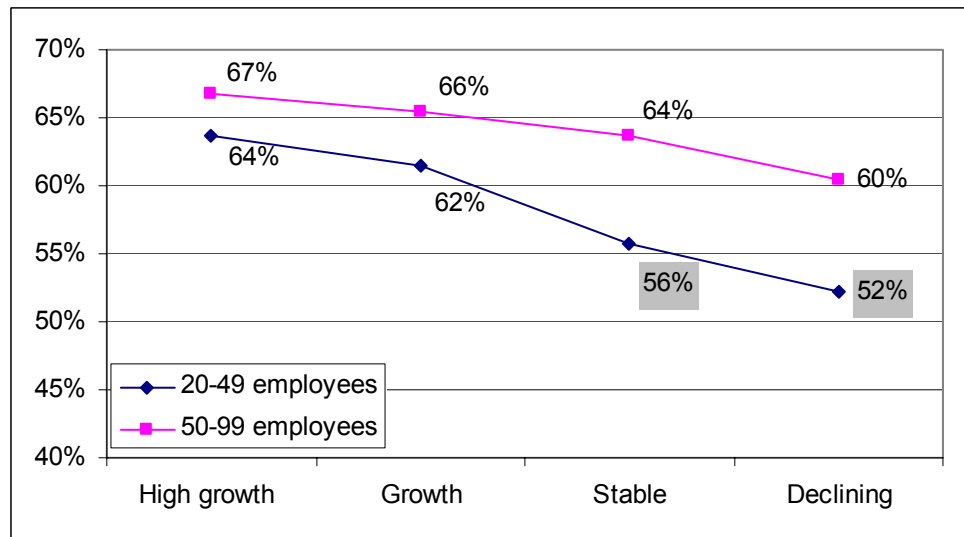
<sup>6</sup> For further information on the theory of competence see Bas (2003).

*Hypothesis #4: Small firms that have developed R&D resources, competencies and capabilities will be more likely to exhibit high growth.*

Data from the *Survey of Innovation 1999* shows that the percentage high growth and growth manufacturing provincial enterprises for both small size categories considered (20-49 and 50-99 employees) which engaged in R&D are not significantly different (Figure 3).

As for the stable and declining manufacturing provincial enterprises, in the case of those with 50-99 employees, the percentage of innovators is not significantly different from those that exhibit high growth, whereas, for those with 20-49 employees, high growth provincial enterprises are significantly higher than both of these types.

**Figure 3: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises that Engaged in Research and Development (R&D) linked to Innovative Products and Processes, 1997 to 1999**

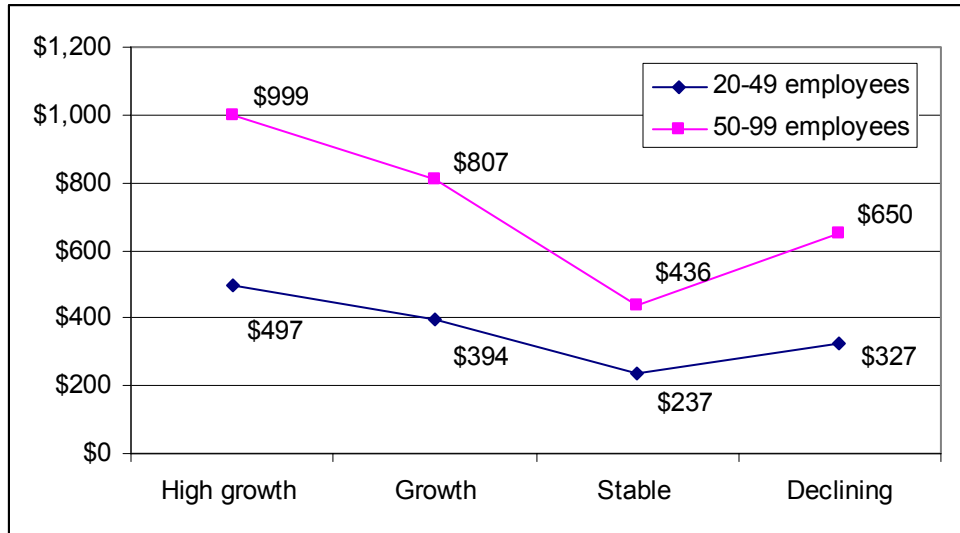


Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

The RDCI (Research and Development in Canadian Industry) surveys all industrial R&D performers in Canada. Figure 4 shows that high growth small R&D performers with 20-49 employees, as well as high growth small R&D performers with 50-99 employees spent, on average, more than all other types of R&D performers in the same size category.

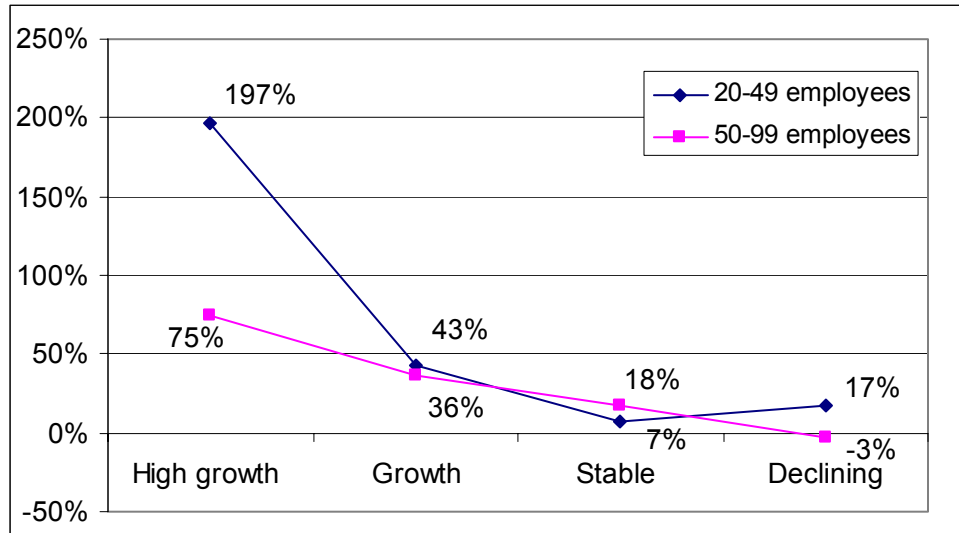
**Figure 4: Average Amount Spent on R&D Activities by Small (20-99) R&D Performers in 1995, (in \$000)**



Source: Statistics Canada, Research and Development in Canadian Industry

High growth R&D performers with 20-49 employees increased their revenues by 197% over the period 1995 to 2000, a much higher percentage than all other types of R&D in both size categories. High growth R&D performers with 50-99 employees increased their revenues by 75% at a higher percentage than all other types of R&D performers in their size category.

**Figure 5: Percentage Change in Revenues of Small (20-99 Employees) R&D Performers from 1995 to 2000, (based on constant 1997 value dollars)**



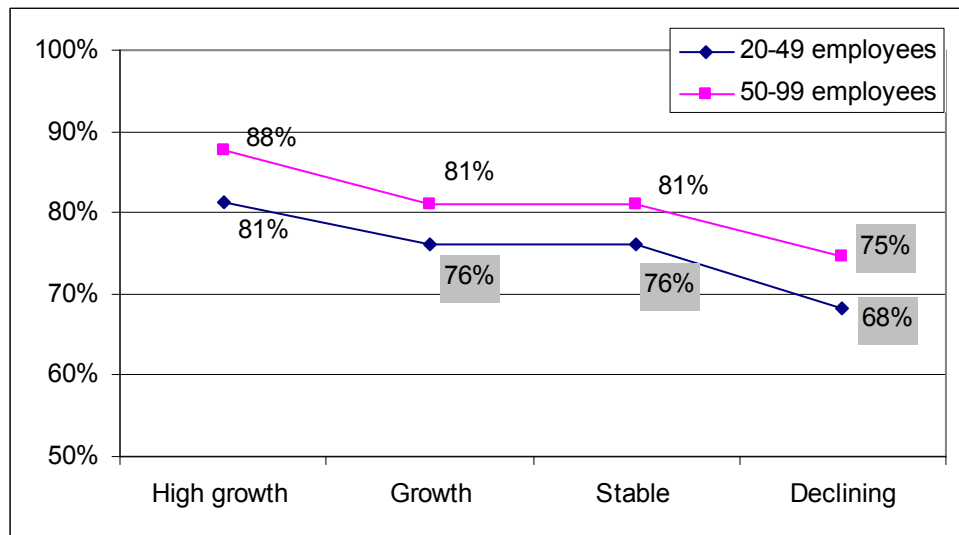
Source: Statistics Canada, Research and Development in Canadian Industry

The interviews of firms that had made the transition from small to medium found that most of the companies interviewed did conduct R&D to develop new products. In a few cases, the R&D was very informal, such as “inventive” founders testing new materials or the software department developing new control programs.

*Hypothesis #5: Small firms that have developed innovation resources, competencies and capabilities will be more likely to exhibit high growth*

Data from the *Survey of Innovation 1999* shows that the percentage of innovators among small high growth manufacturing provincial enterprises with 20-49 employees is significantly higher than for growth, stable and declining provincial enterprises (Figure 6). The percentage of high growth provincial enterprises with 50-99 employees is significantly higher than declining provincial enterprise, but not significantly different from those that exhibit growth or are stable.

**Figure 6: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises that Introduced New or Significantly Improved Products and Processes, 1997 to 1999**



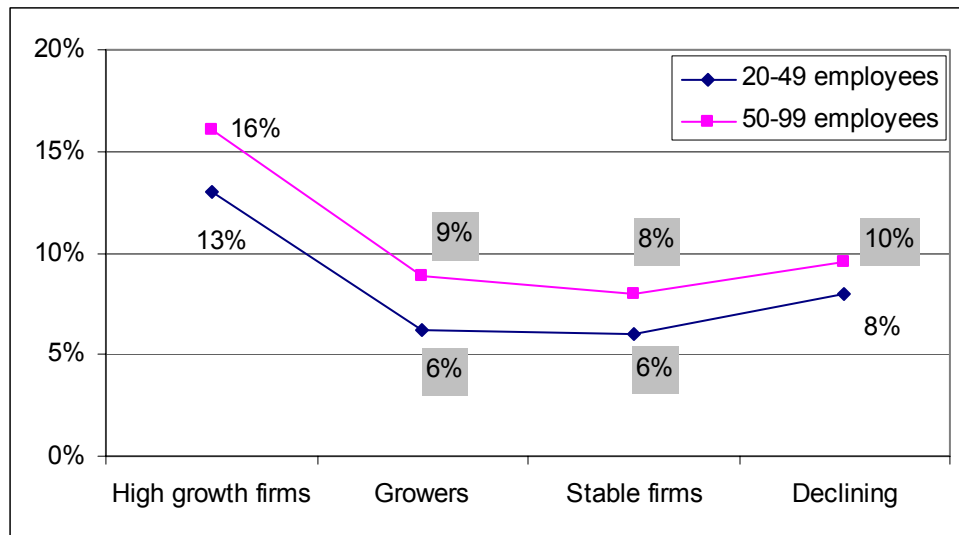
Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

The definition of an innovator in the *Survey of Innovation 1999* is a relatively broad one. Innovation is the introduction of new and significantly improved products or processes. As long as it is the first time the firm introduces the innovation, it is considered to be an innovation, even though other firms might have already introduced the same innovation.

A more restrictive way to define innovation is to consider only firms which characterize their most important innovation as a world-first. Figure 7 shows that, of the provincial enterprises that described their most important innovation, high growth provincial enterprises have a significantly higher percentage that introduced world-first innovations than other types of provincial enterprises, with the exception of small declining provincial enterprises with 20-49 employees.

**Figure 7: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises that Described Their Most Important Innovation and Indicated that the Most Important Innovation Was a World First, 1997 to 1999**



Source: Statistics Canada, Survey of Innovation 1999

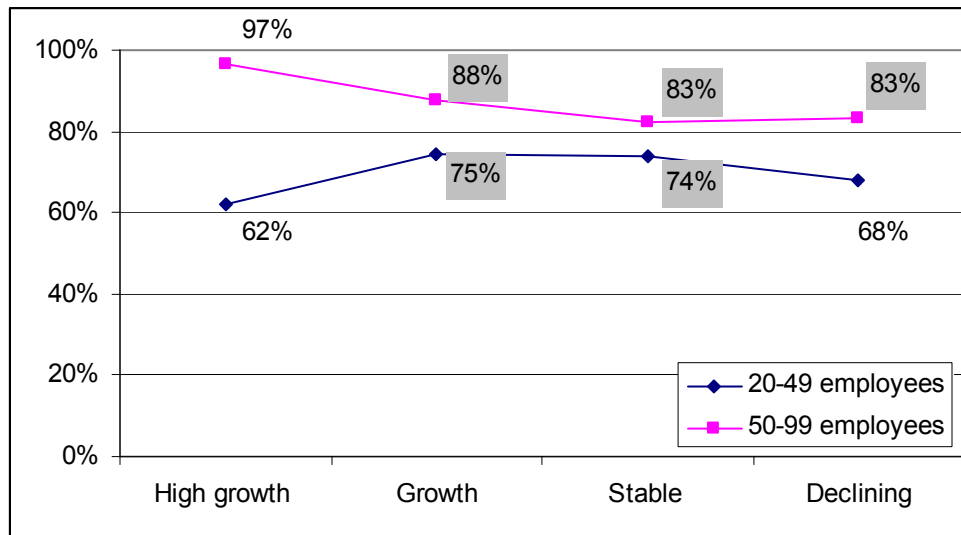
Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

The interviews with firms that had made the transition from small to medium size found that almost all the firms were innovative to varying degrees. The firms conducting R&D were clearly doing so to develop technologies that were “new to the world”. A few advised caution that it was better to remain on the “leading edge” as the “bleeding edge” was too risky. That is, incremental changes were, for some, a better strategy than breaching the frontiers to develop a technology with an unknown future. Some firms indicated that they would modify technology for existing customers or try to sell current technology to new customers but were very wary of trying to develop new products for new customers.

*Hypothesis #6: Small firms that have developed technology acquisition resources, competencies and capabilities will be more like to exhibit high growth.*

The Survey of Advanced Technology in Canadian Manufacturing 1998 asked establishments to indicate which of a listing of 26 advanced manufacturing technologies they were using. These advanced technologies were grouped under five broad categories: Design and Engineering; Processing, Fabrication and Assembly; Automated Material Handling; Network Communications; and Integration and Control. Figure 8 shows that high growth establishments with 20-49 employees had a significantly lower percentage that used a least one of the listed advanced technologies than growing and stable establishments, but were not significantly different from the declining establishments. High growth establishments with 50-99 employees had a significantly higher percentage using at least one of the listed advanced technologies than all other types of establishments.

**Figure 8: Percentage of Small (20-99 Employees) Manufacturing (except Food Processing Industries) Establishments that Used at Least One of a List of 26 Advanced Manufacturing Technologies, 1998**



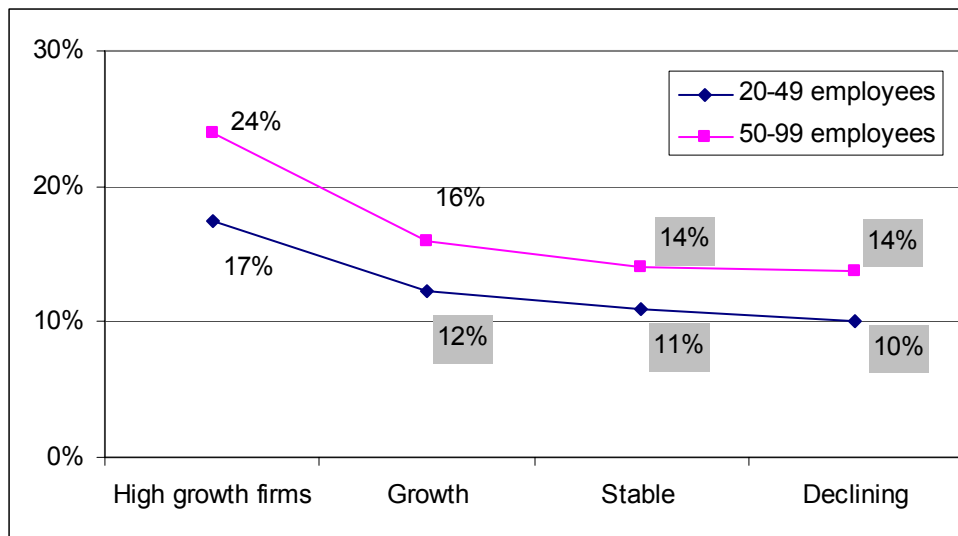
Source: Statistics Canada, Survey of Advanced Technology in Canadian Manufacturing 1998

Note: Shading indicates that the percentages are significantly different than the percentages for high growth establishments.

*Hypothesis #7: Small firms that protect their intellectual property will be more likely to exhibit high growth.*

Data from the *Survey of Innovation 1999* shows that a significantly higher percentage of high growth provincial enterprises with 20-49 employees applied for a patent during the period 1997 to 1999 than other types of provincial enterprises (Figure 9). In the case provincial enterprises with 50-99 employees, the percentage is significantly higher than stable and declining provincial enterprises but not significantly different than growth provincial enterprises.

**Figure 9: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises that Applied for a Patent during the Period 1997 to 1999**

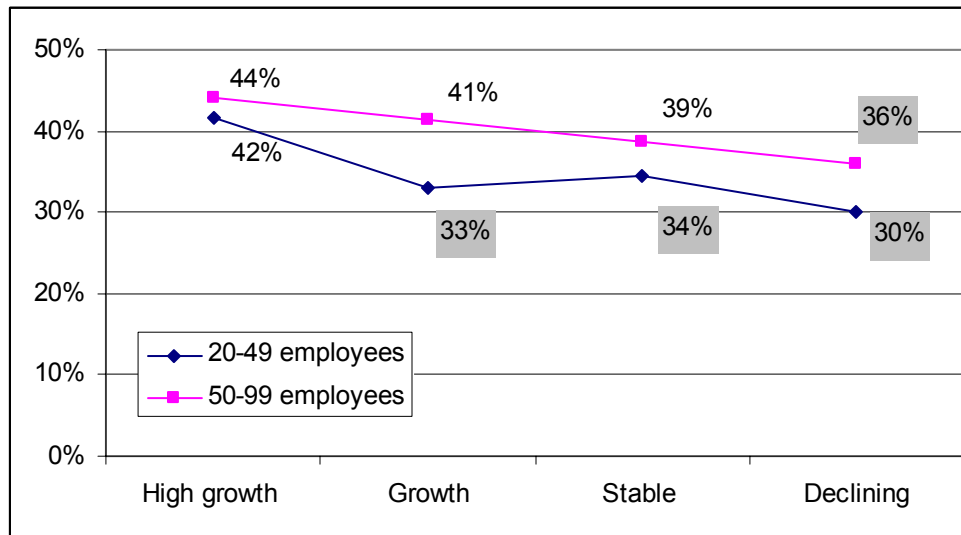


Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises

Confidentiality agreements are another method to protect intellectual property. High growth provincial enterprises with 20-49 employees have a significantly higher percentage of provincial enterprises that use this form of protection than do other types of provincial enterprises (Table 10). In the case of high growth provincial enterprises with 50-99, there is no significantly difference with growth or stable provincial enterprises but the percentage is significantly higher than the declining ones.

**Figure 10: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises that Use Confidentiality Agreements to Protect Their Intellectual Property during the Period 1997 to 1999**



Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises

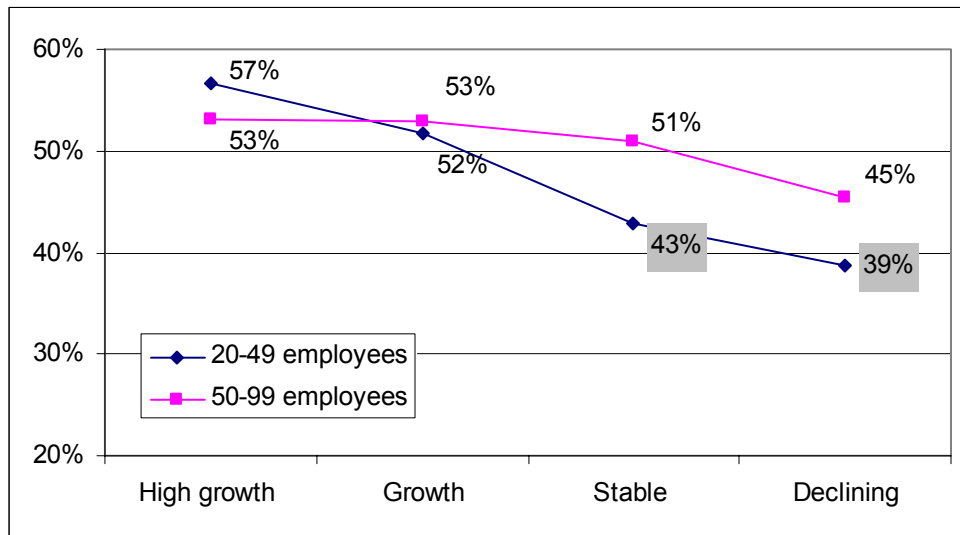
The interviews with firms that had made the transition from small to medium size found that many of the companies interviewed held patents. Some had augmented patents with confidentiality agreements with staff and with partners. Four firms, two software developers and two small manufacturers, relied on confidentiality rather than patents or copyrights.

*Hypothesis #8: Small firms that have developed their capability to access external financial resources will be more likely to exhibit high growth.*

One important source of support is government programs. The extent to which firms use available government programs can be taken as an indicator of their capability to access external resources (financial or other types of support). The *Survey of Innovation 1999* asked manufacturing provincial enterprises which of a list of government support programs listed they used. The list programs included the following types of programs (both federal and provincial): research and development tax credits, research and development grants, venture capital support, technology support and assistance programs, information or internet services, and training.

Figure 11 shows that the percentage high growth provincial enterprises with between 20 and 49 employees that use at least one government support program is not significantly different than growth provincial enterprises but it is significantly higher than stable or declining ones. In the case of provincial enterprises with between 50 and 99 employees, the percentage using at least one government support program is not significantly different than the other types of provincial enterprises.

**Figure 11: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises Using at Least One Government Support Program, 1997 to 1999**

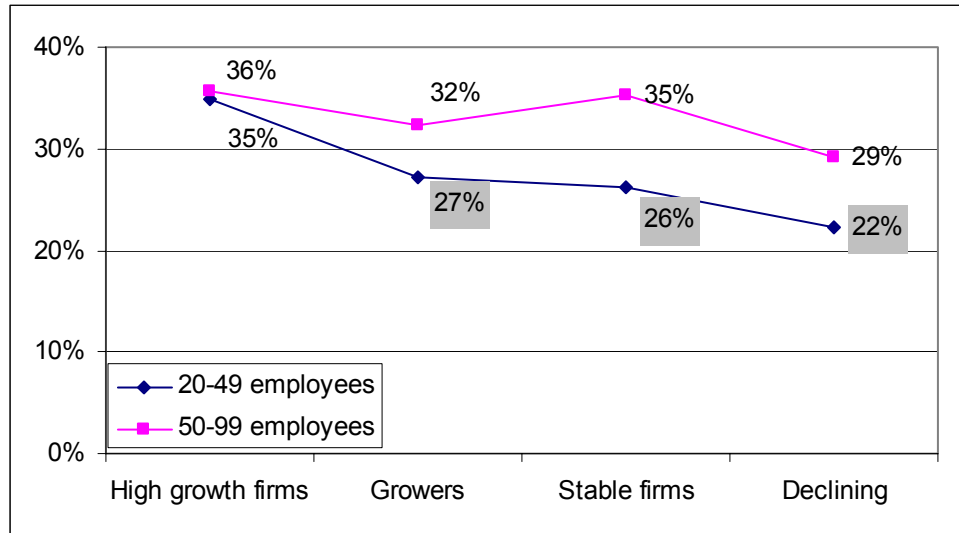


Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

Table 12 shows that for one specific government support programs, R&D tax credits, high growth provincial enterprises with 20-49 employees have a significantly higher percentage of provincial enterprises that use the program than other types of provincial enterprises. For high growth provincial enterprises with 50-99 employees, the percentage is not significantly different than the other types of provincial enterprises.

**Figure 12: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises Using R&D Tax Credit Programs, 1997 to 1999**



Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

Since most of the companies interviewed were still operational, they obviously had some success in obtaining funding. This factor, though, is an overall assessment of the difficulty and success in obtaining funding according to the original plan. While all of the companies that were successful in obtaining their desired funding were also successful in making the transition from small to medium, others that had made the transition did so with various levels of funding success and various approaches to funding. Those that did not obtain all the funding they anticipated (or had difficulty in doing so) stated various reasons for the difficulty such as, inexperience or wanting to maintain control.

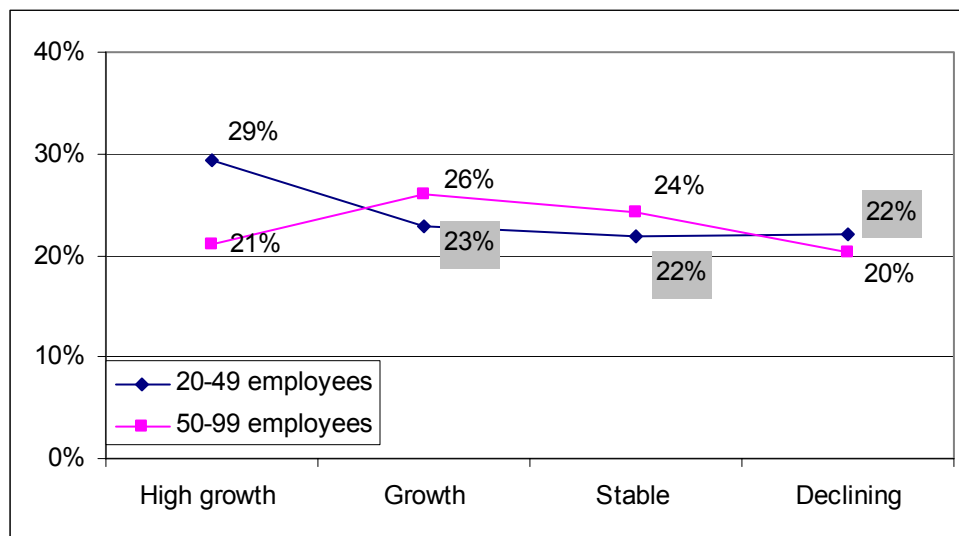
Venture capital funding was often cited as less desirable than private sources since it required relinquishing some degree of control of the company. Similarly, “going public” was often seen as a double-edged sword. Several small firms managed to make the transition to medium-sized through private funding (including savings of the owners, “love money”, angel funding, personal loans), sales of one product to support the development of another, or selling the rights one of their early technologies. One biotechnology company referred to the latter approach as “selling your first-born”.

Obtaining funding was the most commonly cited barrier to the growth of the firm. Several respondents mentioned difficulties in obtaining venture capital. One former CEO remarked that “The government won’t fund anyone who owns a tie”, implying that funding goes for scientific and technological development not business. Canadian tax laws whether personal or corporate were sometimes cited as barriers to growth. Some businesses commented that completing forms required to obtain government grants was sometimes not worth the effort.

*Hypothesis #9: Small firms that collaborate with other firms and organizations will be more likely to exhibit high growth*

The *Survey of Innovation 1999* asked innovative provincial enterprises if they were involved in cooperative and collaborative arrangements with other firms or organizations for the purpose of developing new products and processes. Figure 13 shows that a significantly higher percentage of innovative high growth provincial enterprises with 20-49 employees are involved in collaboration and cooperative arrangements than other types of provincial enterprises. The percentage of provincial enterprises with 50-99 employees involved in collaboration and collaboration is not significantly different than other types of provincial enterprises.

**Figure 13: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises That Indicated that They Were Involved in Collaborative and Cooperative Arrangements with Other Firms and Organizations to Develop Innovative Products or Processes, 1997 to 1999**



Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

Only a few of the firms interviewed that had made the transition had engaged in broad-based alliances with other businesses. Some of the alliances were specialized and

limited. For example, they might engage in an R&D alliance for one specific project, for licensing their technology or for marketing. Those that did not engage in alliances were, for one reason or another, determined to “go it alone”. For some, the reason was to protect their IP. Others were simply cautious about getting too close to the competition. Some of the business alliances were complex, for example one company was licensing their technology to one part of a multinational and suing another part of the same company for patent infringement.

*Summary of Section 7*

- Based on the analysis of the RDCI, high growth small R&D performers in both size categories had both a higher average amount spent on R&D activities at the beginning of the period studied and a higher percentage increase in revenues than growth, stable and declining R&D performers in the same size category.
- A summary of the findings from the eight indicators based on the analysis of the Survey of Innovation are found on Table 5.

**Table 5: Summary of Resource and Capability Indicators-A Comparison of Small (20-99) High Growth Manufacturing Provincial Enterprises with Small Growth, Stable and Declining Provincial Enterprises during the Period 1997 to 1999**

	Are high growth provincial enterprises with 20-49 employees significantly different than:			Are high growth provincial enterprises with 50-99 employees significantly different than:		
	Growth	Stable	Declining	Growth	Stable	Declining
% involved in R&D	No	Yes	Yes	No	No	No
% of innovators	Yes	Yes	Yes	No	No	Yes
% of world first innovators	Yes	Yes	No	Yes	Yes	Yes
% that applied for patents	Yes	Yes	Yes	No	Yes	Yes
% that used confidentiality agreements	Yes	Yes	Yes	No	No	Yes
% that used at least one government program	No	Yes	Yes	No	No	No
% that used R&D tax credits	Yes	Yes	Yes	No	No	No
% involved in innovation collaboration	Yes	Yes	Yes	No	No	No

- In very general terms, based on the indicators developed from the *Survey of Innovation 1999*, high growth provincial enterprises with 20-49 employees are significantly different from other types of provincial enterprises in the same size category. There are two exceptions. First, high growth and growth provincial enterprise are not significantly different in the percentage involved with R&D and the percentage using at least one government support program where they are similar to growth provincial enterprise. Secondly, high growth and declining provincial enterprises are not significantly different in the percentage of world first innovators.
- In very general terms, based on the indicators developed from the *Survey of Innovation 1999*, high growth provincial enterprises with 50-99 employees are not significantly different from other types of provincial enterprises in the same size category. With the exception of the percentage of world first innovators, the high growth provincial enterprises are not significantly different to the growth ones. With the exception of the percentage of world first innovators and the percentage that applied for patents, high growth provincial enterprises are not significantly different the stables ones. High growth provincial enterprises are significantly different from the declining ones for half of the indicators developed: the percentage of innovators, the percentage of world first innovators, the percentage that used patents, and the percentage that used confidentiality agreements.
- Based on data from the Survey of Advanced Technologies in Canadian Manufacturing, high growth manufacturing (with the exception of food manufacturing) establishments with 20-49 employees had a significantly lower percentage that used a least one of the listed advanced technologies, but were not significantly different from the declining establishments. High growth establishments with 50-99 employees had a significantly higher percentage using at least one of the listed advanced manufacturing technologies than all other types of establishments.

## **8. Organizational growth factors**

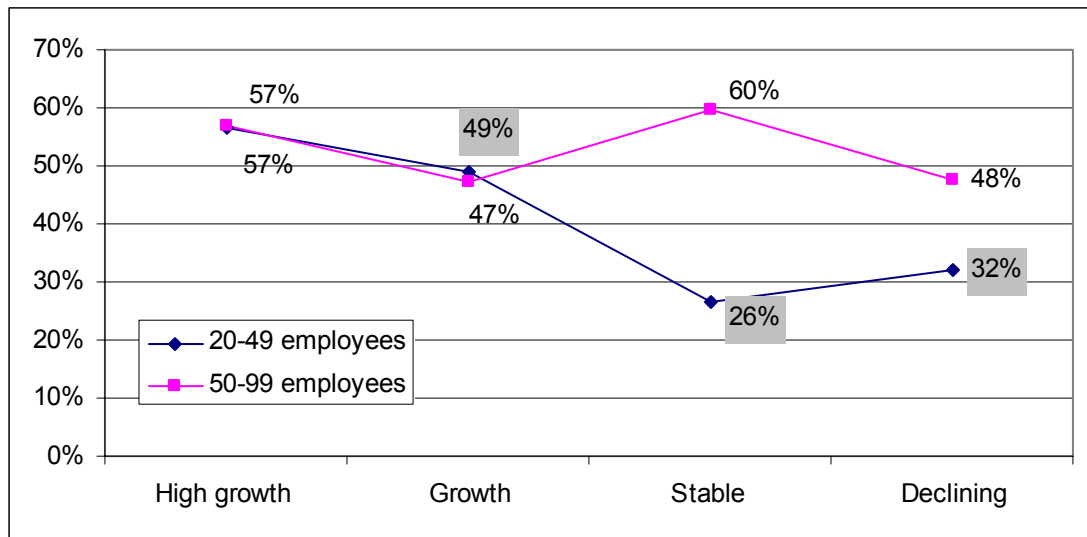
This section will look at organizational factors as possible determinants of high growth in small firms. For the most part, as the purpose of the surveys that are analysed in this report was not to collect data on organizational issues, relatively little quantitative data is available to examine the two hypotheses to be examined in this section. This section will, thus, rely heavily on findings from the interviews. The findings from interviews provide insights on how the issues of organizational growth factors might be measured. A discussion of the measuring of organizational factors can be found in the last section of this report.

Two hypotheses related to organizational factors will be examined: firstly, significant changes to company resources and capabilities will occur as the firm grows from small to medium size and, secondly, significant changes to organizational structures will occur.

*Hypothesis #10: The high growth of small firms will be accompanied by significant changes in the firm's human resource capability*

The *Survey of Advanced Manufacturing Technologies 1998* asked plant managers in manufacturing establishments (with the exception of those in food processing) whether they considered ongoing technical training to be important in the business strategy of their establishment. Figure 14 shows that, for establishments with 20-49 employees, a significantly higher percentage of high growth establishments indicated that ongoing training was important than did all other types of establishments. For high growth establishments with 50-99 employees, there is no significant difference compared to other types of establishments.

**Figure 14: Percentage of Small (20-99 Employees) Manufacturing (except Food Processing Industries) Establishments That Indicated Ongoing Technical Training as an Important Factor in Their Business Strategy, 1995 to 1998**



Source: Statistics Canada, Survey of Advanced Technology in Canadian Manufacturing 1998

Note: Shading indicates that the percentages are significantly different than the percentages for high growth establishments.

While most interviewed businesses that had made the transition from small to medium had few problems in attracting scientists or managers, some did cite problems in attracting persons with specific technical skills. There were also a number of firms that indicated they had difficulty locating a marketing person (where marketing was defined as the ability to not only identify and pursue new clients, but also to locate promising firms with whom to partner and integrate their technology). This was true in many non-biotech firms. Biotech firms tended to rely on their board of directors or scientific advisory board members to identify partners and complementary research. Some of the smaller firms also commented that they were obliged to hire consultants or purchase expensive software simply to create a business plan or to develop a human resources policy.

*Hypothesis #11: The high growth of small firms will be accompanied by significant changes in the organizational structure of the small firm*

One of the qualitative differences between small and medium-sized firms is the degree of formalization of their organization and planning. A medium-sized firm is more likely to adopt management specialization (development, marketing, human resources, administration, etc.) as well as more formal business planning. Although a majority of the firms interviewed had formalized their organization and planning, there were several firms that managed to make the transition with varying degrees of informality.

The less formally managed firms tended to cite their flexibility as a positive outcome. If all business decisions are made at the weekly meeting of partners (and there is no Board of Directors to satisfy), then the company may be in a better position to take advantage of short-term opportunities. Larger, formally-organized firms also mentioned that they needed to maintain some level of flexibility, for example, in terms of a short-term strategic plan that was distinct from the annual business plan. Developing a formal organizational structure in the growing firm usually occurred at the same time as the specialization of the existing staff and the hiring of particular specialists.

## **9. Managerial growth factors**

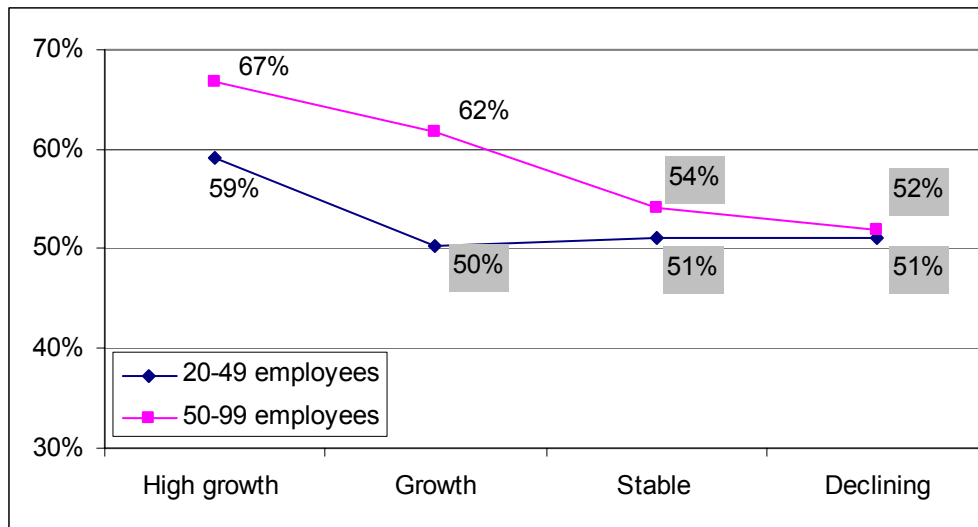
This section will look managerial factors as possible determinants of high growth in small firms. Three hypotheses related will be examined: strategic planning, significant changes in the perceptions of the owner-manager or top management team, and the capability of the top management team to exploit technological and market opportunities

*Hypothesis #12: Small firms that have a strategy for growth will be more likely to exhibit high growth.*

Both the Survey of Innovation 1999 and the Survey of Advanced Manufacturing Technologies 1998 asked questions on a variety of firm success factors and strategies. Of the various factors and strategy, one strategy that stands out in both surveys for small high growth firms is the importance of an export strategy.

Figure 15 shows that high growth provincial enterprises with 20-49 employees have a significantly higher percentage of provincial enterprises that indicated that developing export markets is an important factor of their firm's success than all other types of provincial enterprise. For high growth provincial enterprises with 50-99 employees, the percentage of provincial enterprises is not significantly higher than growth provincial enterprises but is significantly higher than stable and declining firms.

**Figure 15: Percentage of Small (20-99 Employees) Manufacturing Provincial Enterprises That Indicated Developing Export Markets Was an Important Factor of Firm Success, 1997 to 1999**

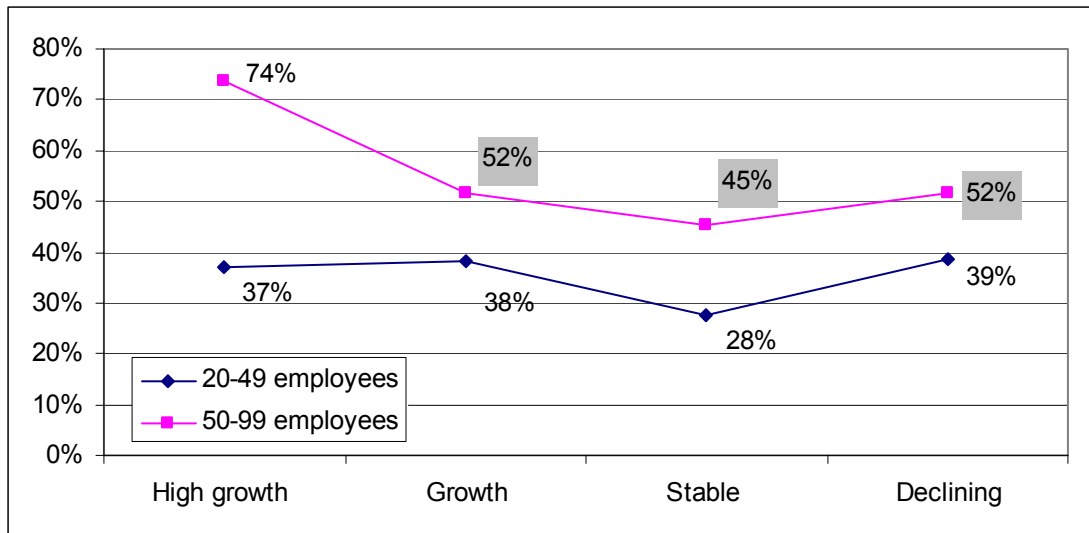


Source: Statistics Canada, Survey of Innovation 1999

Note: Shading indicates that the percentages are significantly different than the percentages for high growth provincial enterprises.

The importance of an export strategy is also shown in Figure 16. For establishments with 20-49 employees, there is not significant difference between the high growth establishments and the other types of provincial enterprises in terms of the percentage of establishments that indicated that their primary product was sold in the US market than all other types of establishments. High growth establishments with 50-99 employees have a significantly higher percentage than all other types of establishments.

**Figure 16: Percentage of Small (20-99 Employees) Manufacturing Establishments (except Food Processing) That Indicated Their Primary Product was Sold in the US Market, 1995 to 1998**



Source: Statistics Canada, Survey of Advanced Technology in Canadian Manufacturing 1998

Note: Shading indicates that the percentages are significantly different than the percentages for high growth establishments.

Interviewed firms that had made the transition from small to medium were assessed as to the degree of competitiveness of their markets. If they were specialized and were in a less competitive market, they were considered to be in a market niche. It has been proposed that firms with a specific market niche would have a greater chance of growing. While most of the firms interviewed that stated they were in a niche did make the transition from small to medium, many of those in moderately or highly competitive markets had also made the transition.

*Hypothesis #13: High growth will be accompanied by significant changes in the perceptions of the owner-manager or top management team.*

The one factor that emerged consistently from the interviews was the importance of business advice. Firms that thrived during an otherwise turbulent period largely attributed their success to previous business experience or timely business advice from outside the firm.

Business advice was brought into the firms in many different ways. A few businesses were founded by individuals with business skills (whether learned formally or on-the-job)

and had little need for outside advice. Others obtained business advice from people outside the firm: members of the board of directors, business coaches and consultants. In several instances, the respondents remarked that they should have sought business advice sooner.

*Hypothesis #14: The owner-manager or the top management team of small high growth firms will have the capability identifying and exploiting technological and market opportunities*

This hypothesis, related to the entrepreneurship spirit of a firm, is perhaps the most difficult of factors to observe and measure, and yet, in the transition from small to medium might be the most critical factor to explain how firms seize opportunities and confront obstacles.

Several firms interviewed, in relating their growth story, mentioned instances in which the future existence of the company was at risk. In one case, a major supplier withdrew the license, and in another a major competitor marketed the technology first. A company's adaptability was often cited in terms of either (a) the diversity of its product line or (b) the flexibility of the company to "retool" or reinvent itself on demand. In contrast, many of the firms that had made the transition had done so with a single product and a single approach.

## **10. Firm archetypes and growth**

It was not the purpose of this analytic report to determine archetypical businesses—that is, classes of businesses with similar characteristics. The danger in not doing so is to assume that all business have the same potential, the same "style" and will react the same way to external stimuli. While we haven't sufficient sample size to conduct a statistical analysis to cluster the businesses interviewed, certain characteristics seem to be important in understanding how businesses grow.

*Industry and technology:* While it is important to know the industry sector of a business to assess which growth factors come into play, even within sectors there will be differences in the stage of technology and processes used. This is especially evident in biotechnology where, at the greatest level of industry sector detail, there remains a great deal of heterogeneity.

*Degree of control:* Almost half the senior managers who were interviewed preferred to maintain control of their business (or technology) over maximizing the benefits. For example, many CEOs avoided selling shares on the stock market or soliciting venture capital because of the loss of control implied. Some firms were started as family businesses and growth was seen as a secondary priority. This is not to say that control and growth are incompatible goals. In fact, many of the firms interviewed managed to grow while maintaining a high degree of personal control. It may be, though, that many of the firms that refused to relinquish control were limiting opportunities for further growth.

*Enterprise life cycle:* Besides the nature of the industry or the control orientation of the leaders, not all managers want a company to grow to medium size. Whether this was to avoid formalization, “playing in the big leagues” or shunning a more competitive environment, some companies did not seek opportunities for further growth. In the secondary literature review above a framework based on Hanks et al. (1993) was presented. It outlines four development stages of an enterprise (start-up, expansion, maturity and diversification) as well as two “disengagement stages”, that is, firms that have stopped wanting to grow. The two disengagement stages are lifestyle (very small firms that remain small to accommodate the lifestyle of the owners) and capped growth (larger small firms that do not grow to where formal organization, financing and management practices are required). Basic choices about the enterprise life cycle should be taken into account in assessing the firm’s commitment to grow.

There is a measurement challenge for each of these archetypes. A brief discussion of each follows:

*Industry and stage of technology:* We have found firms in the same NAICS sector (at the 6-digit level) with widely different strategies, processes and roles in the production process. In this respect, knowing the industry classification is necessary but not sufficient to understand the context of the firm. Knowing its outputs would help to provide further detail. Rather than relying on a standard industry classification by itself, surveys of management practices should also enquire about the nature of the product and the process by which it is being produced.

*Control orientation:* While it may be reasonably simple to infer a firm’s control orientation by interviewing a senior manager, obtaining similar information through administrative data or a questionnaire is more of a challenge. The concept is linked to several other characteristics of the firm such as how it is organized and the type of funding it has pursued in the past. It should be possible to develop a survey instrument that covers these characteristics.

*Enterprise lifecycle:* The age of a firm is insufficient to determine its stage of development. Some of the history of a company’s development could be tracked using administrative data but the intent of the owners to grow or not (thereby defining the “disengaged” firms) would require questions on a special survey.

## **11. What we have learned about the indicators of firms that made the transition from small to medium: The measured, un-measured and un-measurable**

This section assesses data sources, present and potential for obtaining indicators of the growth factors and classification criteria. There are three objectives to measuring the growth phenomena: (1) to better understand it, (2) to estimate its prevalence or importance in the economy or within certain industries, and (3) to determine a value for a specific firm. Each of these would require data at increasing levels of detail and coverage: (1) case studies and pilot surveys, (2) ongoing large-sample surveys, and (3) censuses or administrative data.

An assessment of data availability for some of the key growth factors that have been discussed in previous section is as follows:

*Research and development:* The Research and Development in Canadian Industry (RDCI) survey is a census of all R&D performers in Canada. This measures R&D performed in Canada that adheres to the Frascati Manual (OECD, 2002) definition. This is generally consistent with the definition used for the SR&ED tax credits. The surveys of innovation (one was conducted for manufacturing industries in 1999 and for selected service industries in 2003) ask for more general data on R&D performed.

*Business alliances:* The surveys of innovation (Statistics Canada, 1999 and 2003) do ask about various types of alliances with respect to innovation. They also ask the nature of the collaborator (other industry, public institution, university, etc.) and the distance of the collaborator from the respondent. What is not captured is other forms of alliances, such as marketing partnerships.

*Approaches to funding:* Data on corporate finances and tax records exist but have not yet been exploited for this purpose. The Biotechnology Use and Development Surveys do obtain substantial detail on sources of funding for biotechnology companies, but because of issue of confidentiality were not able to be exploited in this study.

*IP protection:* The surveys of innovation ask about the number of patents and the use of other IP instruments (industrial design registrations, trade-marks, copyrights and confidentiality agreements). Although administrative patent data are available outside of Statistics Canada (from CIPO in Canada and the USPTO in the US), they have not yet been exploited for this purpose.

*Market niche:* We know of no comprehensive data on level of competition faced by a particular business. Some surveys ask the respondent to assess this (e.g., Survey of Innovation 1999 asks about the competitive environment). It may be possible to derive indicators based on the number of businesses within a certain industry classification.

*Business advice:* Business advice could be internal (that is, the founders have business experience or training or there is a board of directors with business experience), external but informal or purchased. There is no single source of data for all of these aspects but questions on the sources of business advice could be asked on special surveys.

*Formal organization and planning:* There may be some information on the formal organization of a business (such as inter-corporate ownership); there is no source of statistical data on the formalization of management or planning.

*Innovation:* Innovation surveys contribute greatly to our understanding of the challenges of bringing new products to market and the processes required to do so. These sample surveys have limitations as to the level of detail obtainable in terms of industry sector, size and location of the firm. Larger-sample surveys (such as Statistics Canada's Survey of Electronic Commerce and Technology) have been used to provide more detail on a limited number of criteria (Earl, 2004).

*Adaptability:* The diversity of the product line could possibly be calculated from existing statistical data (for example, business surveys often ask for an accounting of commodities produced). The strategic nature of the diversity could only be obtained through specific questions on new surveys. Similarly, finding a means to assess the ability of a company to "reinvent" itself would require further research. Interviews or surveys could detect whether adaptation had occurred in the past.

*Management practices:* It would be interest to conduct a specific survey of management practices that would (a) collect the data more systematically and (b) develop means of asking new questions about the firm's history and management "style". This would allow the examination of the various hypotheses that were present on organizational growth factors (Section 8) and managerial growth factor (Section 9). There currently exists relatively little empirical data on these important issues.

## Glossary

**Communities:** includes Census Metropolitan Areas (CMA) or Census Agglomerations (CA). A CMA is delineated around an urban core with a population of at least 100,000, based on the previous census. Once an area becomes a CMA, it is retained as a CMA even if the population of its urban core declines below 100,000. Census agglomerations (CAs) are centred on urban cores with populations of at least 10,000 and not more than 999,999.

**Enterprise:** (the top of the hierarchy), is a business entity with a complete set of financial statements. The enterprise, as a statistical unit, is defined as the organisational unit of a business that directs and controls the allocation of resources relating to its domestic operations, and for which consolidated financial and balance sheet accounts are maintained from which international transactions, an international investment position and a consolidated financial position for the unit can be derived. It corresponds to the institutional unit as defined for the System of National Accounts.

**Establishment:** a business entity capable of providing data on principal inputs, revenues, salaries and wages. The establishment, as a statistical unit, is defined as the most homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production.

**Firm:** is used, in this report, as a generic term to cover all the various statistical units (establishment, enterprise, etc.) as well as to cover the terms used in the secondary literature (company, enterprise, business, etc.).

**Firm size:** The following size categories are used:

<b>Small firms</b>	1-99 employees
	<i>1-19 employees</i> <i>20-49 employees</i> <i>50-99 employees</i>
<b>Medium firms</b>	100-499 employees
<b>Large firms</b>	500 + employees

**Growth:** Firm growth is categorized as follows:

<b>High growth firms</b>	Firms that at least doubled the number of employees and passed the 20 employee threshold
<b>Micro high growth firms</b>	Firms that doubled the number of employees and did not pass the 20 employee threshold
<b>Growers</b>	Firms that increased the number of employees by at least 20% and by less than 100%
<b>Stable firms</b>	Firms that remained within 20% of their employment from the start of the reference period
<b>Decliners</b>	Firms that decreased their employment by more than 20% from the start of the reference period
<b>Dead/unmatched</b>	Firms that did not exist at the end of the five years. In the case of the RDCI, firms that were dead or did not perform R&D at the end of the period

When five years of data are available, growth in the number of employees is measured over this five year period. When the survey data is available only for more limited period of time, the criteria for growth is pro-rated.

**ILU or Individual Labour Unit:** ILU's are a measure of employment. Each employee who works at a particular enterprise, and therefore generates a T-4 record, counts as an ILU. Part-time and seasonal employees are included as employees and are weighted based on T-4 returns. For example, if an individual has part-time employment in Ontario and in Quebec or for Firm A and Firm B within the same province, they would receive two T-4 slips. These amounts from these returns would then be used to create weights for their contribution to employment in the respective firms and/or provinces.

**Provincial enterprise:** a grouping of all establishments for a given enterprise in the same province and industry group.

**Regional enterprise:** is a derived business entity that is based on T-4 tax data from the employees of an enterprise. "Enterprises" are high level business entities for which data on all aspects of business reporting are available from consolidated financial statements. The characteristics of the regional enterprise are determined by the records of the employees who work at locations of an enterprise which are located within a particular region. Regions are "economic regions" which are a grouping of complete census divisions (with one exception in Ontario) created as a standard statistical unit for analysis of regional economic activity. Economic regions are defined to satisfy provincial needs and to accommodate changes in census division boundaries.

**R&D (Research and Development) performers:** carry out systematic investigation by means of experiment or analysis to achieve a scientific or commercial advance.

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## Appendix 1: IRAP/SIEID Working Group

<b>IRAP- NRC</b>	
Claude Attendu	ITA- Quebec
Robert Coffey	ITA-Newfoundland/Lb & NU
Dennis Cooper	LBN-Ottawa
Bill Dobson	ITA-Ontario
Nick Fong	ITA- British Columbia
Denise Guillemette	Lead- LBN - Ottawa
Chuck Harrison (AL)	ITA-Alberta
Roger Wong (SK)	ITA- Saskatchewan
<b>SIEID - Statistics Canada</b>	
Frances Anderson	Co-project Manager
Michael Bordt	Co-project Manager and LEAP
Louise Earl	Interviews
Rad Joseph	Interviews
Charlene Lonmo	R&D and Interviews
Chuck McNiven	Biotechnology and Interviews
Guy Sabourin	Statistical Tables
Susan Schaan	Innovation and Advanced Technologies
Adele St. Pierre	Statistical Tables
Namatié Traore	Interviews
Robert Trudeau	Interviews
Bev Watier	Statistical Tables and Interviews

## Appendix 2: Methodological notes

### **1. Advanced Technologies in Canadian Manufacturing Survey 1998**

**Data Source(s):** Advanced Technologies in Canadian Manufacturing Survey 1998  
Annual Survey of Manufactures 1995  
Annual Survey of Manufactures 1998

**Time Period Covered:** 1995 to 1998

**Reporting Unit:** Establishment (plant)

**Thresholds:** Establishments with at least 10 employees according to Statistics Canada's Business Register.

**Industry and geographical coverage:** All manufacturing establishments operating in Canada as classified by SIC-80, with the exception of food processing.

**Response rate:** 98.5%

**Definition of key terms and variables:**

High growth establishment: an establishment exhibiting at least 51.6% growth in the number of employees or revenues from 1995-1998. The growth has been prorated.

Non-high growth establishment:

Non-high growth establishments can be broken out into three sub-groups including growers, stables and decliners. Growers are establishments with at least 11.6% growth in number of employees from 1995 to 1998<sup>7</sup> but less than 51.6% growth. Of the remaining non-gazelles stables establishments are those that had a change in number of employees (increase or decrease) of less than 11.6%<sup>8</sup> or the number of employees was unchanged. This leaves a group of firms that can be described as decliners which are establishments that had a decrease in number of employees of at least 11.6%.<sup>9</sup>

Firm size:            Small: 10-99 employees in 1995  
                          Medium: 100-499 employees in 1995  
                          Large: at least 500 employees in 1995

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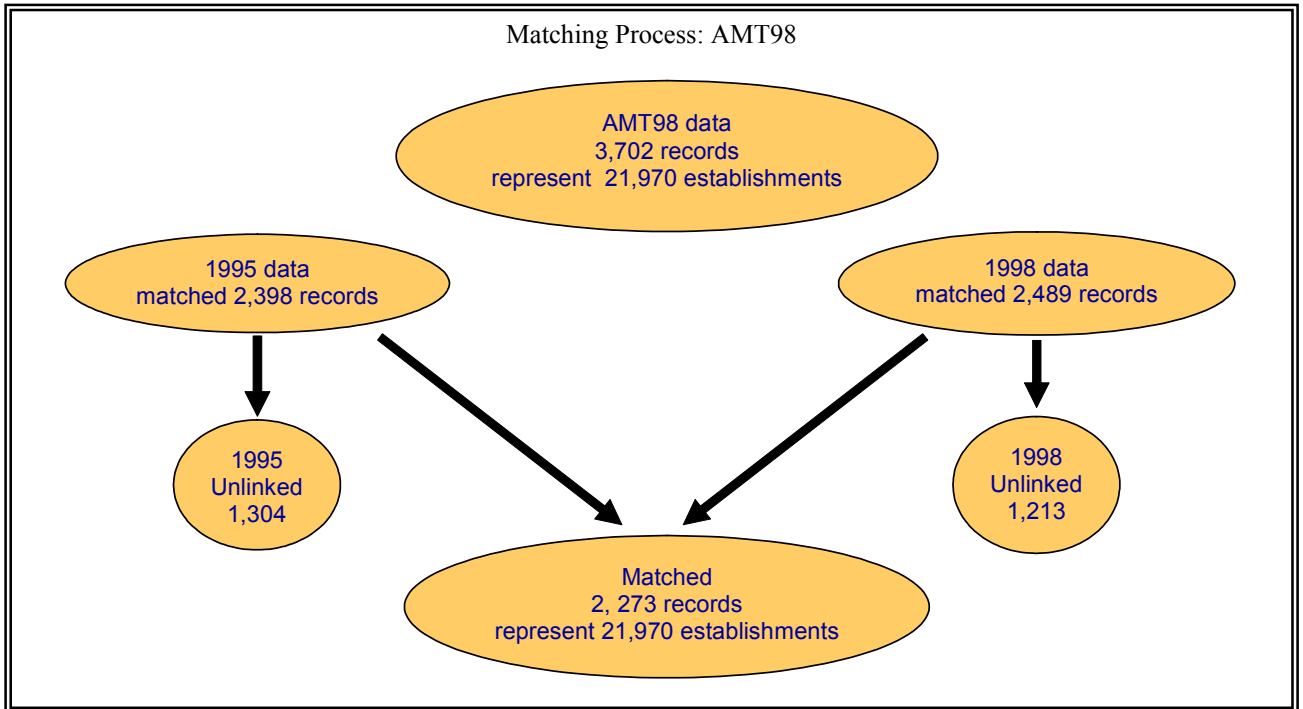
<sup>7</sup> Number of employees must increase by at least 20% over 5 years.

<sup>8</sup> Number of employees fluctuating up to 20% of starting reference year value over 5 years.

<sup>9</sup> Number of employees declines by more than 20% of starting reference year over 5 years.

**Details on the matching process:**

Results from the Advanced Technologies in Canadian Manufacturing Survey 1998 (AMT98) were linked to principal statistics (production data) from both the 1995 and 1998 Annual Survey of Manufactures (ASM). In 1998 2,489 records from the AMT98 were matched to the ASM. It was assumed that in 1998 all establishments that responded to the AMT98 must have existed and would have been able to respond to the ASM98. If a link was not made between AMT98 records and ASM98 data, it was assumed that the establishment was a non-respondent to the ASM98. As a result, remaining records assumed to represent the non-respondents in addition to the establishments they already represented. The resulting file contained data that was representative of the AMT98 population. In 1995, 2,398 records were linked. The result was a file containing 2,273 records representing 21,970 establishments.



**Reference material for methodology:**

Anthony Arundel and Viki Sonntag (1999) *Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998, AMT Survey Results*, SIEID Working paper series, Statistics Canada, Catalogue No. 88F0017MIE No. 12.

David Sabourin and Desmond Beckstead (1999) *Technology Adoption in Canadian Manufacturing Survey of Advanced Technology in Canadian Manufacturing*, SIEID Working paper series, Statistics Canada Catalogue No. 88F0006XPB No. ST-99-05.

## **2. Longitudinal Employment Analysis Program**

**Data Source(s):** Statistics LEAP-SAF (Longitudinal Employment Analysis Program – (Small Area File) for the year 2000. Changes are calculated between 1995 and 2000.

**Reporting Unit:** Enterprise and T4 (one person may be issued more than one T4 tax record per year). Regional enterprises and ILUs are estimated (see below).

**Threshold:** High growth firms are those that doubled in employment between 1995 and 2000.

**Time period covered:** 1995 and 2000

**Industry and geographical coverage:** All industries using SIC (Standard Industries Classification), national

**Response rate (if applicable):** The LEAP-SAF is a census of all businesses with employees.

### **Definition of key terms and variables:**

Statistical units are estimated “regional enterprises”, that is, all establishments of a given enterprise within a community within the same industrial sector. It is these regional enterprises that we are tracking from one period to the next.

The measure of labour is the Individual Labour Unit (ILU), based on the number of T4 records issued. If one person works full time for one company for a year, that person contributes one ILU. If the person works half the year for one company and half for another, he or she contributes one half of one ILU to each company. If the person worked six months for one company and did not work for the other six months, that person contributes one ILU to the company for which they worked.

**Details on the matching process:** The data are already longitudinal.

### **Reference material for methodology:**

Acton-White Associates (2002). *High-Growth Companies, Mapping Canada’s Entrepreneurial Landscape*, Industrial Analysis and Strategies Branch, Industry Sector, Industry Canada. Internal document.

Bordt, Michael. (2004 forthcoming). *Community innovation: the geographic distribution of high-growth firms*. SIEID Working paper series, Statistics Canada Cat. No. 88F0006XIE2004099. Ottawa, Canada.

Katz, Sharonne and Michael Bordt. (2004 forthcoming). *Community innovation: Industrial specialization in Canadian cities*. SIEID Working paper series, Statistics Canada Cat. No. 88F0006XIE2004099. Ottawa, Canada.

White, Kenneth. (2003). *Notes for Small Business Policy Branch on the Small Area File (SAF) for Growth Firms in Canada Project*. Internal document. Industry Canada, Small Business Policy Branch.

### **3. Survey of Innovation 1999**

**Data Source(s):** Survey of Innovation 1999  
Annual Survey of Manufactures 1997  
Annual Survey of Manufactures 1999

**Time Period Covered:** 1997 to 1999

**Reporting Unit:** Provincial enterprise (firm)

**Thresholds:** Provincial enterprises with at least 20 employees and at least \$250,000 revenues according to Statistics Canada's June 6, 1999 Business Register.

**Industry and geographical coverage:** All manufacturing firms, as classified by NAICS<sup>10</sup>, operating in Canada.

**Response rate:** 95%

#### **Definition of key terms and variables:**

**Provincial enterprise:** A grouping of all establishments for a given enterprise in the same province and industry group (defined at the four-digit NAICS level).

**Innovation:** The Oslo Manual (OECD/Eurostat, 1997) outlines proposed guidelines for collecting and interpreting innovation data at the firm level. The survey adopted this approach as it allows for the production of internationally comparable, meaningful indicators of innovation. This approach considers that a firm is innovative if it had a new or significantly improved product (good or service) introduced to the market or a new or significantly improved process used in production in the previous three years. The entry level is new to the firm.

**Cooperative and Collaborative arrangements:** Involve the active participation in joint projects between the firm and other firms or organizations in order to develop new or significantly improved products (goods or services) and/or production/manufacturing processes. Pure contracting-out work, where there is no active participation, is not regarded as collaboration or cooperation.

**High Growth:** at least 32% growth in the number of employees from 1997-1999<sup>11</sup>

**Non-High Growth:** Non-High Growth can be broken out into three sub-groups including growers, stables and decliners. Growers are firms with at least 7.6% growth in number of employees from 1997 to 1999<sup>12</sup> but less than 32% growth. Of the remaining non-high growth firms, stable firms are defined as those that had a change in number of employees (increase or decrease) of less than 7.6%<sup>13</sup> or the number of employees was unchanged. This leaves a group of firms that can be described as decliners which are firms that had a decrease in number of employees of at least 7.6%.<sup>14</sup>

**Firm size:**

- Small: 20-99 employees in 1997.
- Medium: 100-499 employees in 1997
- Large: at least 500 employees in 1997

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<sup>10</sup> North American Industry Classification System, Statistics Canada 1998, Catalogue No. 12-501-XPE.

<sup>11</sup> At least doubled the number of employees over a five year period

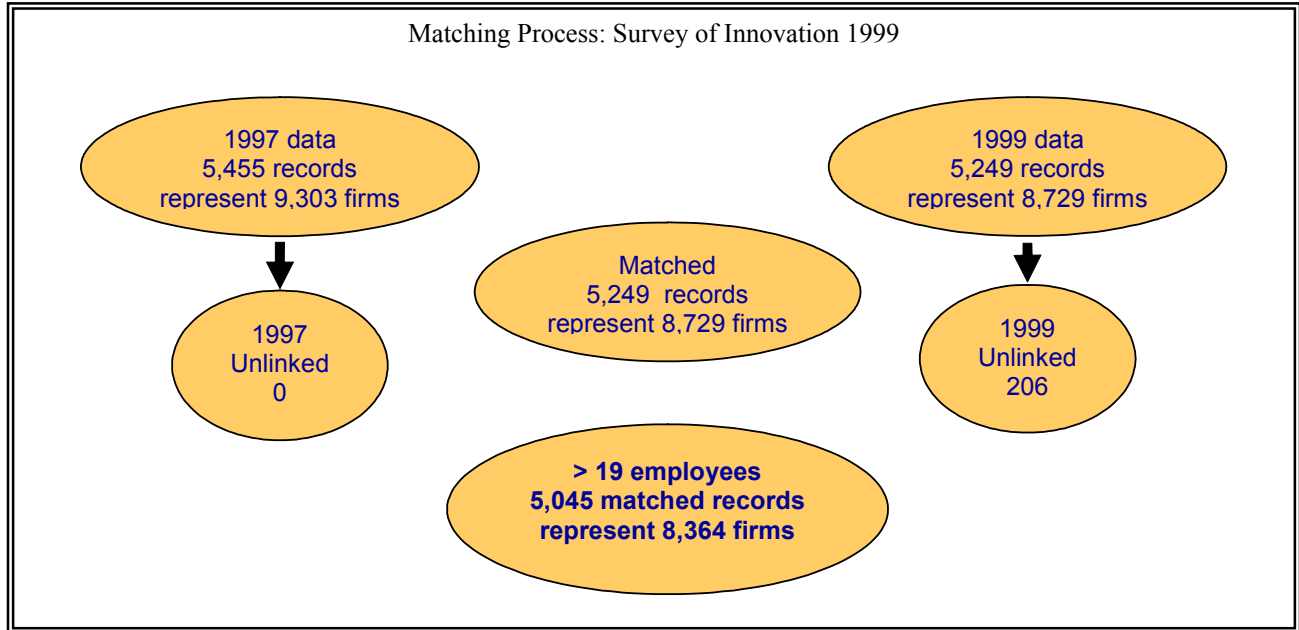
<sup>12</sup> Number of employees must increase by at least 20% over 5 years.

<sup>13</sup> Number of employees fluctuating up to 20% of starting reference year value over 5 years.

<sup>14</sup> Number of employees declines by more than 20% of starting reference year over 5 years.

**Details on the matching process:**

Results from the Survey of Innovation 1999 were linked to principal statistics (production data) from both the 1997 and 1999 Annual Survey of Manufactures (ASM). In 1997 all 5,455 records from the Survey of Innovation 1999 representing 9,303 firms were matched to the ASM. In 1999, 5,249 records representing 8,729 firms were linked. The ASM collects data on number of employees. Using the value of number of employees derived from the ASM, records for firms with less than 20 employees were excluded from the analysis. The result was a file containing 5,045 records representing 8,364 firms.



**Reference material for methodology:**

OECD/Eurostat (1997). *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data* (Oslo Manual), Paris.

Statistics Canada, (1998). *North American Industry Classification System - NAICS Canada*, Statistics Canada Catalogue No. 12-501-XPE.

Schaan, S and B. Nemes (2002). *Survey of Innovation 1999, Methodological Framework: Decisions Taken and Lessons Learned*. Statistics Canada Catalogue No. 88F0006XIE2002012.

Schaan, S and F. Anderson (2001). *Innovation in Canadian Manufacturing: National Estimates*. Statistics Canada, SIEID Working paper series, Statistics Canada Catalogue No. 88F0006XIE01010.

Schaan, S, F. Anderson and G. Sabourin (2001). *Innovation in Canadian Manufacturing: Provincial Estimates*. SIEID Working paper series, Statistics Canada Catalogue No. 88F0006XIE01013.

## **4. Research and Development in Canadian Industry Survey**

**Data Source(s):** The data for the Research and Development in Canadian Industry (RDCI) database come from two primary sources. For the largest R&D performers, those who spend more than \$1 million per year on R&D, the data are obtained from a paper survey questionnaire. The questionnaire is sent to approximately 1,000 firms each year and covers about 90% of all industrial R&D spending. The remaining data are obtained from Canada Customs and Revenue Agency (CCRA). In order to obtain tax credits firms must apply to CCRA by completing a Form T-661. Many of the questions on this form are the same as the questionnaire but with less detail. These data are then supplemented with information from the Business Register (country of control and NAICS code).

**Reporting Unit:** The reporting unit is the enterprise with one added variation. In the case of enterprises with more than one location for R&D activity, the enterprise can report the various locations. Data in this report is based only on the total enterprise.

**Threshold:** All companies who apply for and are granted the SR&ED tax credit are included in the database. There are no minimum thresholds for size with respect to revenues, nor employment.

**Time period covered:** The database goes back to the early 1960s with a number of significant methodological changes along the way. In the early years the survey was a questionnaire based survey only and was undertaken once every two years. By 1969 the survey was annual. During the interval 1970 to 1981, the survey alternated between a census survey and a sample survey; after 1981 it was a census survey. For year 1994 and beyond CCRA (tax) data was included. This significantly improved coverage for the smallest firms.

**Industry and geographical coverage:** The database covers all of Canada and all NAICS classifications.

**Response rate (if applicable):** With respect to the paper questionnaire, the response rate is approximately 70%, with values being imputed for non-response. For the administrative records “response rates” do not apply.

### **Definition of key terms and variables:**

**R&D:** defined by the *Frascati Manual* as “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”. (Chapter 2.1, paragraph 63)

**Micro High Growth:** firms which double in employment but do not report 20 or more employees by 2000

**High Growth:** firms which double their employment and which do report 20 or more employees by 2000

**Growers:** firms which report employment growth of between 20 and 99%

**Stables:** firms which report no substantial change in employment (i.e. the number of employees in the firm changes by less than 20%)

**Decliners:** firms which report declines of 20% or more in total employment

**Industries:** the industries used for publication of RDCI data are based on 6-digit NAICS codes. Some industries, such as pharmaceuticals and computer systems design, are composed of a single 6-digit NAICS industry code while other industries (for example, wholesale trade or finance, insurance and real estate) are composed of many dozens of 6-digit NAICS industry codes. The industry groupings are designed to allow the greatest detail in information while maintaining confidentiality.

The industrial classification system changed fundamentally in 1997. Prior to that year, businesses were classified using the SIC 1980 system, from 1997 and beyond the NAICS system has been used. For the purposes this paper, the NAICS system has been applied unless otherwise specified. For the matched

records the NAICS code as of 2000 was used to classify firms. For the unmatched records an estimation program, based upon the official concordance tables<sup>15</sup>, was used to determine the NAICS based industries. This was done in a multi-step process. For certain 4-digit SIC codes there is a single 6-digit NAICS code which matches. For other 4-digit SIC codes there are multiple 6-digit NAICS, but all of these 6-digit codes fall into a single 2-digit RDCI NAICS-based industry. For a few industries however, it was not possible to make a perfect match from 4-digit SIC to 2-digit NAICS-based industry. In these cases the best match was selected based on the total number of firms in each category and the total amount spent. In virtually all cases there was one choice which was clearly the best. In only one case, where the SIC was 7759 (scientific and professional services), was it not possible to select a best match. In this case the firms were distributed by weight (based on the number of firms and the amounts spent) into four industry groups.

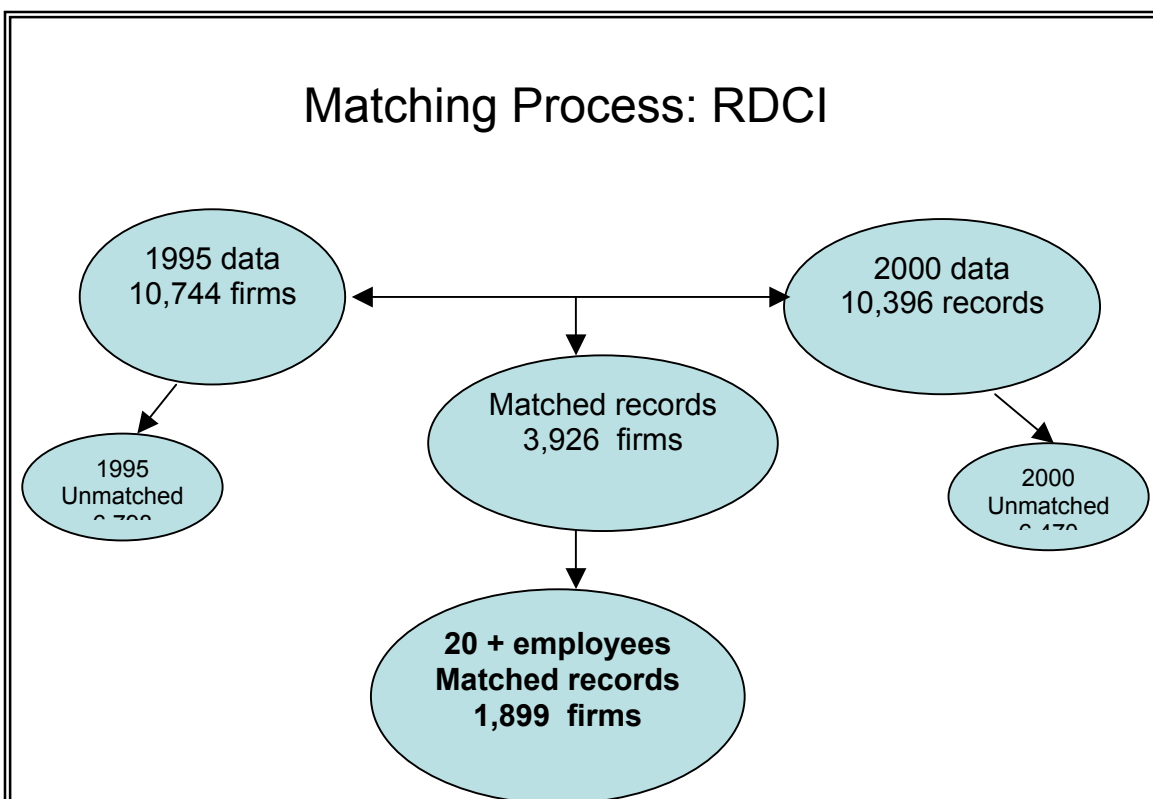
**Employment:** total employment includes all current employees

**R&D employment:** are reported in full-time equivalents (for example: 2 individuals whose work consists of R&D for half of their time would be reported as 1 R&D worker)

**Revenues:** as reported or revenues for tax purposes

**Total R&D spending:** includes current and capital spending during the reference year

**Details on the matching process:** Enterprises which reported performing R&D in 1995 were matched with all enterprises which reported performing R&D in 2000. The enterprises were matched by firm name (exact spelling) and Business Number (BN).



**Reference material for methodology:**

OECD (2002). *Research and Development in Canadian Industry: Data Quality Statement 4201 Frascati Manual*.

<sup>15</sup> <http://www.statcan.ca/english/Subjects/Standard/concordances/sice80-to-naics97-det.htm>