Innovation, Training and Success

by

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Abstract

This paper describes the evidence that several Statistics Canada studies have developed on the importance of innovation to growth and the need for highly skilled workers in the innovation process. Rather than focusing on broad industry aggregates as is often done, we concentrate our attention on firms and their behaviour. This allows us to investigate the connection between the success of businesses and the strategies that they pursue.

We find that the more successful firms attribute their success to having developed competencies in a wide range of areas—but that the common factor that most frequently distinguishes faster from slower growing firms is innovation. Innovators in turn place greater emphasis on training and acquiring skilled workers.

The studies also show that the emphasis on highly skilled workers varies across industries. In goods industries, a training strategy complements an innovation strategy that focuses on R&D, the adoption of new advanced technologies, or the development of new processes. Small firms that are innovative train their workers when they introduce new machinery and equipment. In the service sector, the innovation strategy relies less on new capital and more on new skills embodied in the workforce. Here there is evidence that a training strategy, by itself, has more impact on the success of a firm—probably because it is more likely to be *the* innovation strategy of the firm.

Keywords: innovation, training, worker skills, advanced technology

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Introduction

Over the last decade, growth in the Canadian economy has been faster in higher value-added industries, industries that are sometimes referred to as the knowledge economy. Industries such as electrical equipment, computers, and computer services have led the way. These industries are at the forefront of innovation (Baldwin and Da Pont, 1996; Baldwin, Gellatly, Johnson, and Peters, 1998). They also make intensive use of highly skilled workers.

Focusing on highly visible industries, such as computers, can lead to the mistaken impression that innovation is only found in high-tech industries (Baldwin and Gellatly, 1998). In reality, innovation is occurring in many industries. And within industries, firms that are innovative are the ones more likely to be growing.

This paper describes the evidence that we have developed on the importance of innovation as a factor behind growth and the need for highly skilled workers in innovative firms. Rather than focusing on broad industry aggregates as is often done, we concentrate our attention on firms, which are the underlying microeconomic units that make up industries. This permits us to better understand the forces that contribute to growth. Our research strategy has been to develop a broad overview of the activities and competencies of these firms and to relate it to measures of their success (Baldwin, Chandler, Le and Papailiadis, 1994; Johnson, Baldwin and Hinchley, 1997; Baldwin, Gray and Johnson, 1997; Baldwin and Johnson, 1999b).

Here, we focus on our findings regarding the connection between a firm's innovativeness and measures of its success. We also examine the emphasis that a firm places on human resource strategies, in particular on training, and how this relates both to a firm's innovativeness and to its success.

Before summarizing our findings, it is important to outline the research strategy that has been employed. Our research makes use of surveys that investigate the extent to which firms develop competencies in a range of different functional areas—management, finance, production, human resources, and marketing. By taking this broad approach, we develop a framework that places particular activities (e.g., training) in context of the overall strategic orientation of a firm. The strategic orientation of a firm is determined by the emphasis that is placed on a wide range of areas (management, finance, production, human resources) as well as the activities that are implemented to achieve the competency levels to which a firm strives. By examining how strategies are combined, we can infer the degree to which complementarities exist between different functional areas. For example, the stress that is placed on recruiting skilled workers (a strategic orientation) or the existence of training programs (an activity that supports the strategic orientation) can be related to the firm's innovation strategy (whether it is innovating, the type of innovations that are being introduced and whether it relies on R&D for innovation). This approach allows us to examine how various competencies are combined within a firm and whether innovation is associated with the development of specific capabilities.

The research program has targeted certain sub-populations that are seen to be of critical importance to the growth process. *The Survey of Growing Small and Medium-Sized Enterprises* focuses on small and medium-sized firms in both goods and services industries that were growing over a five-year period. The *1996 Survey on the Characteristics of Bankrupt Firms* investigated the cause of failure in corporate bankruptcies. *The 1996 Survey of Operating and Financing Practices of New Firms* concentrated on new firms in both the goods and services sectors that were born in the early 1980s and survived through to their early teen years. The 1993 *Survey of Innovation and Advanced Technology* covered both large and small firms in the manufacturing sector. The 1996 *Survey of Innovation* covered firms in financial services, communications and business services.

In each of our studies, we develop a profile of firm strategies and activities using surveys that achieved response rates of over 80%, thereby allowing accurate inferences about the underlying populations. Just as important, we generally link this profile to firm performance. Using data to measure firm performance, we ask how the competencies in the area of innovation or human resources differ between more-successful and less-successful firms.[1]

This paper summarizes the salient points of our research that touch on the connection between innovation, success and training.[2] The interested reader will find more details in the studies included in the reference list at the end of the paper.

Innovation and Success in Small and Medium-Sized Firms

Using the survey of growing small and medium-sized enterprises, Baldwin et al. (1994) report that small and medium-sized firms feel that skilled labour is one of the most important factors contributing to their growth. This emphasis on skilled labour comes second only to that placed on management. Some 52% of firms have either a formal or informal training program to improve the skills of their employees; 36% have formal training programs. In contrast to the accent placed on human resources, much less emphasis is placed on a strategy that develops new technology or which is aimed at introducing R&D-based innovations. Only 10% of firms report employment in an R&D unit or investment expenditures devoted to R&D.

While firms tend to place more emphasis on their human resource strategy than on their innovation strategy, the latter is the key factor associated with growth. Using a measure of firm performance that is defined as a weighted average of the growth in market share, the productivity and the profitability of a firm relative to other firms in an industry, the sample of growing firms[3] was divided into the more-successful and the less-successful group of firms. The key factor that distinguishes the two groups is the degree of innovativeness of the firm (Baldwin, 1996). More-successful firms tend to place greater emphasis on R&D capability and R&D spending. They are also more likely to stress the development of new technology, to place greater emphasis on using

[1] This is more accurate than the alternate method that asks firms to subjectively compare themselves to their competitors with regards to sales growth and profitability.
[2] An earlier partial summary can be found in Baldwin, Diverty and Johnson (1995).
[3] All firms in the survey had positive growth rates over a five-year period in the mid 1980s.

new materials, process control and just-in-time inventory techniques. Differences in the emphasis that the two groups give to R&D strategies are accompanied by differences in the intensity of R&D activities. More-successful firms are more likely to have an R&D unit. They are also more likely to use R&D tax credits. They are more likely to report that they use patents to protect their innovations (Baldwin, Rafiquzzaman, and Chandler, 1994a and 1994b).

In contrast, for all industries taken together (both goods and services), there is no significant difference between the more and less-successful firms with regards to the emphasis placed on labour skills—on the extent to which they attribute their success to skilled labour, or the extent to which the skills of their employees contribute to their competitive position. Moreover, there is no significant difference in the extent to which the more-successful firms report that they actively engaged in training, either of a formal or informal nature. There is also no significant difference in the percentage of employees receiving training or in the average training expenditure per employee.

Differences in the emphasis given to innovation as opposed to training are also found in the evaluation given to government programs. More-successful firms give a higher rating than less-successful firms to government R&D support programs; they give a lower rating to government-supported training programs. While more firms take advantage of training programs than R&D subsidy programs, the majority of those availing themselves of government training programs rate them as 'ineffective'—even more so in the more-successful than the less-successful group. In contrast, the ratings for R&D programs are more likely to be given a rating of 'effective'—especially in the more-successful group.

These differences pertain to a sample of firms taken from both goods and services industries—but a sample that deliberately over-weights the manufacturing sector. Therefore, it is noteworthy that the results for manufacturing differ from service industries in two ways.

First, the type of innovation strategy that distinguishes more-successful from less-successful firms varies by industry. In manufacturing, more-successful firms place greater emphasis on R&D innovation capability and on the development of new technologies. In business services, more-successful firms focus on technological capability—the improvement of technology. In the construction sector, it is the improvement of new technology that distinguishes the more- from the less-successful firms. The distinguishing factor for the primary sector (mining, forestry, oil wells) is the emphasis that is placed on developing refinements in the technology purchased from suppliers.

Second, while human resource strategies are not related to success in manufacturing, they are elsewhere. In business services, retailing, wholesaling, as well as accommodation and food services, the more-successful firms give greater emphasis to either skilled labour, continuous staff training, innovative compensation packages or some combination thereof.

Technology Use and Success

The findings of the GSME survey, using evidence on the emphasis that firms give to innovative strategies and activities, are confirmed by studies that employ data on the incidence and intensity of advanced technology use. Like innovation, technology use is linked to success.

The 1989 *Survey of Manufacturing Technology* examines the extent to which plants in the manufacturing sector use advanced technologies in different functional areas of the firm—in fabrication and assembly, inspection and communications, integration and control, and design and engineering. Data from this survey are linked to the performance of plants during the 1980s. Performance is measured using information on a plant's sales, labour productivity and wage rates. Technology-using plants are then compared to non-technology using plants to study whether the market share, the productivity and the wage rate paid differ between the two groups (Baldwin, Diverty and Sabourin,1995).

Technology-using plants are generally found to have increased their market share relative to non-technology using plants. Market share growth is higher for users of advanced technologies in the fabrication and assembly area than for most of the other functional areas. It is also relatively high for plants that are comprehensive technology users, that is, for plants that combine technologies from several of the functional groups (design, fabrication, communications, and integration and control) to produce an integrated production environment.

Plants that had managed to successfully incorporate advanced technologies into their production process by 1989 are characterized by higher increases in labour productivity relative to non-technology users over the previous decade—when the technological advances were occurring. Technology users in all areas, with the exception of fabrication and assembly, also experience a growth in labour productivity relative to non-users. Those that integrated technologies from several areas experience the highest productivity growth rates. These gains are mirrored by increases in production worker wages.

While plants that successfully adopted advanced technologies generally manage to increase their market share, they do not manage equally dramatic gains in their employment share. In general, the increase in their labour productivity just offsets their superior sales growth and they generally experience only marginal increases in their share of total employment. The notable exception here occurs for small firms, where both market and employment share increase significantly.

In conclusion, two different sources of data confirm that innovation and technological change at the micro level are connected to success. The first of these uses a survey that focuses on the importance that firms attribute to various innovation strategies and competencies; the second uses comprehensive information on the types of technologies being employed. That the answers are similar should not be surprising. The adoption of advanced technologies facilitates both process and product innovation. Innovation and technology adoption should have similar effects on firm performance.

The Role of Human Resources in Innovation

- ***Industry Differences***

While the emphasis given to developing skilled labour is not itself linked to success in the *Growing Small and Medium-Sized Enterprise Survey*, it is nonetheless important. Innovation may be a key to success, but advanced worker skills are often seen to be essential to innovation. Training is the primary method used by firms to improve skill levels.

Baldwin and Johnson (1996b) confirm the close connection between training, labour skills, and innovation. Using the survey on growing small and medium-sized enterprises, several different innovator types of firms are identified—comprehensive innovators, those making use of both inside and outside sources for their innovations, those focusing on R&D, and those relying on outsiders for innovation. When comprehensive innovators are divided into quartiles on the basis of their innovativeness, some 80% of firms in the top quartile are found to have a training program; only 36% of the bottom quartile have one. Training is also positively related to the emphasis that a firm gives to total quality management.

Important differences exist in these relationships between manufacturing industries and both the dynamic service sectors (business services, communications, finance, transportation, and wholesale), and traditional service sectors (retail, personal services, education, health, accommodation, food, and beverages).

This difference is reflected in the relative emphasis that is placed by innovators and non-innovators on skilled workers in the two sectors. While innovators give more emphasis than do non-innovators to the importance of skilled employees in both sectors, the difference is much greater in service industries. Each of the human resource strategies that were investigated—continuous staff training, specially designed compensation programs—is given relatively greater weight by innovators in the service sector. This indicates that innovation is more tightly bound up with worker skills in the service sector than in manufacturing, where machine and equipment play a more important role in the innovation process.

One of the reasons for this is the difference in the production environment of manufacturing and services industries. The share of investment in plant and equipment in manufacturing firms is much higher than for firms in the service sector; in contrast, firms in the service sector spend relatively more on market development and training. Manufacturing firms are more ‘equipment oriented’; service firms are more ‘people oriented’. The capital of manufacturing firms is more concentrated in hardware; the capital of service firms is more likely to emphasize or rely on knowledge that resides in employees.

This is reflected in significant differences in the determinants of training in the manufacturing and service sectors. In both manufacturing and dynamic service industries, a broad general emphasis on innovation is significantly related to training. In manufacturing, an emphasis on R&D-based innovation is also significantly related to the training decision, which is not true of services. In

manufacturing but not in services, training is positively related to increases in capital intensity, which arise from the adoption of more equipment per worker. In the service sector but not in manufacturing, the training decision is closely related to the emphasis that the firm places on product quality as a marketing strategy and on the emphasis that is placed on the importance of skilled labour as a factor contributing to a firm's success.

These results indicate that more-innovative firms in both goods and services are more likely to upgrade worker skills with training programs. But in manufacturing, the innovative process combines new equipment with more highly skilled workers. Training is required here both to develop these new technologies and to permit workers to operate them. In services, the human resource strategy is closer to being the central focus of the innovation strategy and has an independent effect on the training decision. In service industries, the capital essential to innovation is more likely to reside in human form. In the dynamic service sectors, both innovation and an emphasis on human resources drive the training decision. In the traditional service sector, it is primarily the emphasis on worker skills that drives the training decision.

- ***Differences by Innovation Types***

Classifying innovators by industry reveals that there are important differences across industries in the factors that are associated with growth. In an attempt to better understand the reasons for these differences, we also group firms from the *Growing Small and Medium-Sized Enterprise Survey* on the basis of innovator type and examine differences in their profiles (Baldwin and Johnson, 1997; Baldwin and Johnson,1998).

Three innovator types are chosen—firms focusing primarily on product, process, or combined product/process innovations. These groups can be found at different stages of the innovation network. Some industries (e.g., machinery and equipment, chemicals) produce products, either materials or technologies, that are incorporated into other industries as processes (Robson, Townsend, and Pavitt, 1988). Other industries innovate primarily by incorporating new materials, machinery and equipment, or technologies originating in other industries. Still others produce new products that are incorporated into other sectors and, at the same time, incorporate innovations from other industries into their production process.[4]

Product/process distinctions can also be used to represent different stages in the development of a product (see Gort and Klepper, 1982 ; Klepper and Millar, 1995; Klepper, 1996). Product innovators occupy the first stage—when the product is initially conceived, growth tends to be rapid, competition focuses mainly on new product attributes, and entry and exit rates are high. Comprehensive (product/process) innovators occupy the second stage, where product demand is still growing, and where firms also focus on process innovation so as to bring price and costs down. Process innovators are found in the third stage—when the product characteristics have become well established, and firms seek to improve their market share mainly by improving their production efficiencies.

[4] Of course, even in industries that tend to consist mainly of one or other innovator types, there will be a mix of various types of innovators.

Using a taxonomic approach that classifies firms in the GSME survey into those focusing primarily on product innovation, primarily on process innovation, and on combined product and process innovation, Baldwin and Johnson (1997, 1998) delineate the extent to which the importance given to complementary strategies such as skilled labour varies across innovator types.

An earlier study (Baldwin and Johnson, 1996a) reports that innovators develop more competencies in a wide range of areas (management, finance, marketing, and human resources) than do non-innovators. When the same issue is examined using product/process groupings, Baldwin and Johnson (1998) show that there are differences in the extent to which the different innovation types develop certain competencies. In particular, innovators that focus on both new products and processes are the most compleat firms. They are not only the most consummate innovators in that they introduce both products and processes, but they also give greater emphasis than other innovators to most of the functional areas—including human resources. These activities are accompanied by more favourable performance—generally higher sales and profit growth.

Within each class of innovator, the type of innovation that is associated with success varies. Product innovators are significantly more successful if they also focus on developing some expertise in process innovation. The most consummate innovators—those introducing both product and process innovations—are more successful if they focus on areas that are associated with the development of the most novel forms of innovation—stressing R&D and the development of leading-edge technologies.

Within each innovator group, a common element of success is a commitment to training—in particular formal training.[5] However, there are large differences across innovator types in the significance of the relationship. Within the product-innovator group, success is significantly related to the emphasis placed on the labour climate, the importance of labour skills, and continuous training. Training expenditures per employee for the more-successful product innovators are considerably higher than for the less-successful product innovators. Among comprehensive innovators, the more-successful are much more likely to have a formal training program. Among process innovators, there is also a greater commitment to formal training in the more-successful group, but the difference is not statistically significant.

[5] The stress placed on human resources is negatively related to success in the non-innovator group.

Technology Use and Training

The connection between innovation and training that was found in the GSME survey is confirmed by evidence from surveys that focus on technology use in the manufacturing sector. Using the *1989 Survey of Manufacturing Technology*, Baldwin, Gray and Johnson (1996) indicate that managers of manufacturing establishments who use advanced manufacturing technologies like flexible manufacturing systems, robots, computer-based design and engineering systems generally report that the skill requirements in their plants increased after the implementation of these technologies. In turn, technology-using plants are more likely to have a formal training program. In addition, firms are more likely to train if they use a larger number of advanced technologies, and if they conduct R&D. Firms in industries that have been found to be more innovative are also more likely to have training programs. Characteristics such as higher firm growth rates, difficulties in hiring, large size of parent and being foreign-owned are also associated with a greater probability of training.

Technology Use and Skill Requirements

If advanced technologies require higher skills, this should be reflected in higher wages in technology using plants. Baldwin, Gray and Johnson (1997) and Baldwin and Rafiquzzaman (1999) investigate the relationship between the average wage paid in a manufacturing plant and advanced technology use—as measured by both the incidence of use across functional groups and the intensity of use. Plants that use advanced technologies in inspection and communications, design and engineering as well as integration and control pay their workers more. Moreover, this effect is more pronounced for blue-collar (production) workers than for white-collar (non-production) workers.

Innovation, Technology Use and Skill Shortages

That training is more intensive for innovative firms suggests that during the process of innovation, serious skill shortages emerge. This is confirmed in several of our studies—both for the manufacturing and the service sectors.

Baldwin and Da Pont (1996) report that over 50% of innovators in manufacturing industries experienced an increase in their skill requirements as a result of innovation; while virtually no firms report a decrease in skill requirements. Firms that develop more novel innovations (those that were world-first) are more likely to report an increase in skill requirements than those introducing imitative innovations. Perhaps more indicative of the importance of skill requirements, the lack of skilled personnel is the impediment to innovation that is most often cited by innovators in the manufacturing sector. Over 46% of manufacturing firms (Baldwin, 1997) report that a lack

of skilled personnel acts as an impediment to innovation—significantly more than report that they lack information on technologies, on markets, on technical services, or inter-firm co-operation.[6]

Similar results emerge from the *1996 Survey of Innovation*. Over 30% of firms in financial services, business services and communications report that their innovation increased skill requirements, while virtually none report that skill requirements decreased (Baldwin, Gellatly, Johnson and Peters, 1998). Lack of qualified personnel is reported to have been an important impediment by 22% and 30% of innovators in communications and business services, respectively. It is less important in financial service industries.

The manufacturing plants in the *1993 Survey of Innovation and Advanced Technology Use* also indicate that labour problems are an important impediment to technology adoption (Baldwin and Sabourin, 1996; Baldwin, Sabourin, and Rafiquzzaman, 1996). Some 39% of technology users indicate that either a shortage of skills, training difficulties, or labour contracts provide a significant impediment to the introduction of advanced technologies. Some 25% focus on skill shortages as being the most important impediment. Labour-related problems are second in importance after the cost of the capital.

Consistent with the existence of widespread labour-related impediments is the finding that manufacturing plants adopting advanced technologies report that training costs increased substantially (Baldwin, Gray and Johnson, 1996). The increase in training costs that are associated with the adoption of new technologies is not trivial. At least one-third of plants that report an increase in costs associated with technology use also state that technology use increases their training costs significantly, not marginally. The problems faced by Canadian firms in this area are somewhat greater than those of American establishments (Baldwin and Sabourin, 1997). The majority of manufacturing plant managers in both countries indicate that the adoption of advanced technologies increases education and training costs. The percentage of Canadian managers doing so is slightly higher than for managers in the United States.

It is noteworthy that differences in skill shortages exist not just between non-innovators and innovators—but also between firms that differ in terms of the intensity or novelty of the innovation. Skill shortages are always higher in firms that are ‘more-innovative’. The impediments to innovation associated with skill shortages are reported more frequently by innovators that introduce world-first innovations than by those introducing an imitative innovation (Baldwin and Da Pont, 1996). These differences indicate that while developing new products and processes, innovators unearth problems that have to be solved. The more advanced the innovation, the more frequent are the problems that have to be overcome.

We might expect that impediments would be higher, not lower, in firms that do not innovate or that do not adopt advanced technologies. As the above example indicates, the opposite occurs. This result is found in other studies. Baldwin, Sabourin, and Rafiquzzaman (1996) find that almost twice as many users of advanced technologies in the manufacturing sector report a labour-

[6] See also Baldwin and Hanel (1999).

related problem (40%) as do non-users (23%). These types of differences also exist between innovative and non-innovative small firms in business services industries (Gellatly, 1999).

This pattern reflects the fact that it is by adopting the difficult and risky strategy of being a technological or innovation leader that a firm learns about the problems that it has to overcome. Prior to adopting an aggressive innovation strategy, firms will have formed a general though imprecise idea as to the problems that they will face. They obtain additional information when they proceed to innovate.

This interpretation is borne out by two other studies that investigate the relationship between the probability of skill shortages being reported and the intensity of innovative activity. We find that skill impediments to technology adoption in the manufacturing sector increase as a firm becomes more innovative—whether measured by the number of advanced technologies that it adopts or whether it is introducing product and process innovations (Baldwin and Lin, 1999). Similar results hold for skill impediments in the business service sector (Gellatly, 1999).

Technology Use and Firm-Specific Training Requirements

Training is one option that can be used when skill shortages develop. Training may impart relatively generic and easily transferable skills. Or it may involve the development of firm-specific skills. The latter are likely to be part of in-firm training programs because it is primarily in this venue that these skills are developed. The interesting issue, then, is whether the type of skills required by an innovation strategy are so specific to individual firms that training is required at the plant level, as opposed to more broadly based generic skill enhancement that is done within the public education system. Two of our studies address this issue.

Baldwin, Gray and Johnson (1996) use data from the *1989 Survey of Advanced Technology* and find that training programs are more likely to be done in-house when the firm is more advanced—when it has an R&D facility, when it is foreign-owned and when it develops its own technologies. Baldwin and Peters (1999) use data from the *1993 Survey of Innovation and Advanced Technology* and demonstrate that firms using advanced technologies and reporting the introduction of innovations are more likely to use on-the-job or other forms of in-house training than are non-technology users.

In conclusion, firms that are more likely to use advanced technologies find more labour impediments, are more likely to implement training programs and conduct these programs—either on-the-job or in a classroom within the firm.

Success and the New Firm Population

Entrants provide an important source of dynamic change. They are often at the origin of new ideas. They offer competition to incumbent firms. But they are also more at risk than any other group. Less than one in five new firms will survive to their teen years. It is, therefore, important to know whether the success of this group is also connected to their innovation and human resource strategy.

Johnson, Baldwin and Hinchley (1997) provide an overview of the competencies developed by new firms that survive into their teen years, using *The* 1996 *Survey of Operating and Financing Practices* of entrants. This survey describes the competitive environment that entrants face, the competitive strategies that they adopt, the types of investments made, their asset structure and their sources of financing. More importantly, their profile of competencies is linked to data on their sales and financial structure that allow us to measure the performance of each of the entrants. Like the *Growing Small and Medium-Sized Enterprise Survey*, the entrants survey covers commercial firms in both the goods and services sectors, but it provides a larger sample in the service sector, thereby allowing us to focus more intensely on the sector where an emphasis on training alone was found to have had a close relationship with firm growth.

New firms focus primarily on their established business. The most important marketing focus is on satisfying existing customers. To do so, they concentrate on quality of product and customer service. More aggressive strategies like targeting new domestic or foreign markets or introducing new products are less important. Nevertheless, a large proportion of new firms engage in one or more forms of innovative activities (Baldwin, 1999). Some 39% report the introduction of an innovation, or perform R&D, or emphasize the development or purchase of technology.

As was found in our study of growing small and medium-sized enterprises, managers of surviving entrants consider human resources to be critical to their success. Rating (on a scale of 1 to 5) the importance of human resources to the ongoing success of their firms, over 50% of the managers of new firms give it a high rating of 4 or 5. Concomitantly, some 52% of successful entrants provide formal on- or off-the-job training programs to their employees. Money spent on training accounts for an average of 22% of investment expenditures for respondents who train and report investment in training (Johnson, Baldwin and Hinchley, 1997).

As well, there is a strong relationship between the innovative stance of an entrant and its training activities. Some 80% of those firms that report a product or process innovation have a formal training program; only 45% of non-innovators do so (Johnson, Baldwin and Hinchley, 1997). This relationship is also found when more comprehensive measures of innovation are compared to the importance that firms attach to skilled workers or training (Baldwin, 1999). Thus, training is key to both an innovation and a technology strategy in new firms.

As before, success is closely related to innovation. Faster growing entrants are twice as likely to report an innovation. Faster growing entrants are more likely to invest in R&D and technology. They are also more likely to introduce new products. They are more likely to be targeting new foreign markets (Baldwin and Johnson, 1999a). Faster growing entrants are also more likely to

emphasize training, the recruiting of skilled employees and incentive compensation programs (Baldwin, 1999).

As was the case for growing small and medium-sized enterprises, entrants that introduce both new products and processes are the most successful, that is, they are more likely to be faster growers. They also place a greater emphasis on training than pure product or pure process innovators for new firms.

What is just as significant, more-innovative firms that have implemented a training program are more likely to be faster growers than those that have just introduced an innovation (Baldwin, 1999). Training is, therefore, complementary to an innovation strategy.

Finally, our studies show that growth is strongly associated with the innovative stance of entrants in both goods and services industries. The emphasis on human resource strategies is found to have a separate and significant effect on growth in the service sector but not in the goods sector.

Conclusion

For the management specialist of today, isolating the factors that are associated with success is as difficult as it was for alchemist of yesteryear to turn dross into gold. We do not aspire to such miracles. We do not conclude from our research that training and innovation are either a necessary or a sufficient condition for success. Rather our research has looked for general patterns (not specific actions) that are associated with differences in performance—patterns that allow us to draw generalisations about the areas in which firms might focus their search for the appropriate specific activities.

In the first instance, our research focused on describing the extent of industrial change. Firm turnover that is generated by growth and decline in the industrial population is high. Over 40% of the market share of an average manufacturing industry is transferred from declining firms to growing firms over the course of a decade (Baldwin, 1995).

Our second step was to investigate the extent to which growing firms differ from others with regards to the stress that they place on different aspects of innovation—either introducing new products or new processes. We find that the more-successful attribute their success to having developed competencies in a wide range of different areas—but that the common factor that most frequently distinguishes faster from slower growing firms is innovation. Innovators in turn place greater emphasis on a wide range of competencies—one of these is the emphasis that is placed on skilled labour. While innovators place a greater emphasis on recruiting skilled workers than do non-innovators, what really distinguishes innovators is their reliance on formal training programs. More-innovative firms need workers with new skills and their requirements are sufficiently firm-specific that they adopt individualized training strategies.

Our work also shows that the emphasis on highly skilled workers varies across industries. In goods industries, a training strategy complements an innovation strategy that focuses on R&D, the adoption of new advanced technologies, or the development of new processes. Firms that are innovative train as part of a process that implements new machinery and equipment. In the service sector, the innovation strategy relies less on new capital and more on new skills embodied in the workforce. Here there is evidence that a training strategy, by itself, has more impact on the success of a firm—probably because it is more likely to be *the* innovation strategy of the firm.

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