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## **Innovation in Small and Medium-Sized Enterprises**

### **Abstract**

The purpose of this paper is to discuss and analyze some topics that characterize innovation in small enterprises, aiming to provide a theoretical landmark to be used by more empirically-oriented research. The topics discussed in this paper are: the innovative activities related to small businesses, the advantages and disadvantages of small businesses from the innovation perspective, the influence of venture capital, the importance of strategic alliances as a supplementary factor to the innovative effort and finally the government's role as a stimulator of innovation at small businesses.

### **Keywords**

Small and Medium-Sized Companies, Innovation, Technology

### **Biographical Notes**

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## **Introduction**

Up until the 1990s, in the context of a less globalized economy, businesses could choose between making technology or buying technology, that is, investing in technology or simply buying it from outside sources, oftentimes obsolete and incapable of leading to full exploitation by the acquiring business. With the globalization that took place in the 1990s, the scope of competition goes beyond domestic borders and becomes worldwide, giving rise to much greater concerns over quality, productivity and competitiveness. Currently, businesses either invest in developing new products/new processes or face the risk of having to shut down.

If globalization demands that businesses pay more attention to the issue of innovation, for small enterprises, whose hands are always full with short-term problems, innovation unfortunately seems to be something belonging to a distant reality, particularly as regards innovation in its radical sense – innovations capable of generating major economic and market impact [1]. In most small businesses, emphasis is still – at best – on incremental innovation, that is, technical improvements made continuously and systematically. Such improvements, despite lacking the impact of radical innovation, are crucial for a business to gain competitiveness and productivity, with Japanese companies as a typical example of how the effective use of concepts connected to incremental innovation can ensure competitiveness in several economic sectors.

In this sense, the purpose of this strictly theoretical paper is to discuss and analyze some topics that characterize innovation in small enterprises, aiming to

provide a theoretical landmark to be used by more empirically-oriented research. In order to do so, we will first define and analyze innovative activities that more immediately concern small businesses. Following, item 2 addresses some advantages and disadvantages of small businesses from the innovation perspective. Item 3, in turn, analyzes the influence of venture capital on innovation by small businesses. The importance of strategic alliances as a supplementary factor to the innovative effort is described in item 4, while item 5 addresses the government's role as a stimulator of innovation at small businesses. Finally, item 6 draws some perspectives on the topic.

### **1. Context of the innovative activity at small businesses**

According to the Oslo Manual [2], technological innovation of a product or process can be divided into the following activities: Research and Development (R&D), technology acquisition, tooling up and industrial engineering, industrial design, production start up, marketing for new and improved products and training.

Unlike large businesses, whose innovation is usually founded on the R&D activity, the most classic and most addressed of all innovative activities, at small businesses (with the exception of small-sized technological base businesses and highly entrepreneurial ones) most innovation is found not in R&D, but, rather, in activities connected to the production line, in activities concerned with the adaptation of technologies acquired from outside or in small technical improvements implemented by the industrial engineering area. This type of Innovation was named "Non-Routine Engineering" by the Anpei Database on Technological Innovation Business Indicators [3], meaning engineering activities

that directly relate to the innovation process, involving the development of products and processes, such as design, tooling, establishment of new work plans and patterns, plant reorganizations, etc.

Sterlacchini [4] empirically verifies the above information by researching 143 small Italian businesses from several technologically traditional industries (clothing, furniture, plastic products, footwear, dies). For these companies, the expenditures on innovation based on engineering, design and marketing are substantial, with an effective impact on the businesses' exports performance. The author also suggests that more attention should be paid to this matter, particularly by the makers of public policies relating to innovation, as a result of its impact.

If R&D expenditures are concentrated in large companies, according to Freeman and Soete [5], the concentration of patents in small businesses is relatively high. According to Patel and Pavitt [6] in the United Kingdom, in the 1970s, the largest 100 companies in term of R&D answered for 91% of the total corporate R&D expenditures, while, in terms of patents or number of innovations, they were responsible for only 60%. This suggests that it is easier for smaller companies to invent (and patents are the proxy that best relate to invention) than to innovate (which requires greater investment to introduce new products into the market) [7].

An offshoot of this "ease" of invention is found in the fact that small businesses are an important source of innovation for larger ones. For Schuetze [8], innovation at small businesses is more influenced by external sources than at large companies. Such outside sources can be universities, research institutes,

R&D carried out by other large companies, specialized technical services or the customers themselves, whose demand for changes or improvements to products usually finds a warmer welcome at small businesses. Berry and Taggart [9] and Chakrabarti [10] reinforce this notion by pointing out the significant role played by small businesses as a dominant source of innovation in the early stages of technology, with the innovative focus carrying to larger companies in more mature stages of the technological life cycle, where greater capital needs exist.

It is also important to note that each stage of any given technology is associated with different innovation strategies, as pointed out by Roberts [11]. At the first stage, the standard involves finding more radical product innovations, introduced by highly entrepreneurial small organizations. The intermediate stage of the technological life cycle includes important process innovations, alongside small changes to the product and an increased number of competitors, both large and small. Finally, the last stage is characterized by small changes to the product or process, performed by large companies, arising mainly from the need to cut costs and improve product quality.

## **2. Small Businesses' Advantages and Disadvantages**

Rothwell and Dodgson [12] point out several advantages and disadvantages displayed by small businesses as compared to large companies as regards innovation. As regards management processes, small enterprises are much less bureaucratic, which causes the decision-making process to be faster than at large companies. This lends much greater flexibility to market changes, enabling small businesses to dominate specific niches. Besides, the fact that

smaller businesses' innovation structures tend to be simpler than at large companies makes innovation costs much lower.

As regards technical aspects, small businesses are at an advantage because of the fact that there are governmental structures to support small businesses, which subjects them to less regulations to large companies. Another positive point is their ability to learn more quickly as a result of their simplified structure. Their chief disadvantage lies in the difficulty small businesses have in controlling their suppliers and entering in advantageous partnerships with them, which is a routine fact for large companies. Table 1 points out some of these advantages and disadvantages more clearly.

Table 1, allows one to perceive that the small businesses' advantage lies in their behavioral aspects, that is, flexibility, decision-making speed, accelerated learning, the need to adapt in order to survive or the prospecting of new markets. Large companies' edge lies in their material aspects, that is, R&D quality, the ability to retain a highly qualified technical team, more easily obtained financing and maintenance of lines of research. However, we must note that these advantages and disadvantages may vary according to the field of activity addressed.

### **3. Venture capital as an impact factor for innovation by small businesses**

Several studies show that the percentage of small businesses that shut down before one year in operation is rather high, somewhere between 50% and 80% (a precise figure is impossible as most businesses fail to formalize closure). One of the main causes of such high mortality rates is the lack of financing [13].

Obtaining resources turns into a complex task for recently instituted small-sized businesses. These are often forced to seek financing under the same conditions as larger ones, leading to a biased selection process.

Thus, venture capital, as an atypical form of funding, is an excellent opportunity for small businesses to avoid the collateral or the high interest rates that prevail in the ordinary financial market. There is, however, the problem that not all fields of activity are aligned with venture capital practices. Industries with very long return maturities or that require very high capital infusions will not often be financed by venture capital.

In this sense, Porter [14] states that one of the explanations for the fact that the United States are highly competitive in software or bio-technology lies in the great amounts invested as venture capital. In fact, after Larson [15], venture capital investments in the U.S. were at US\$ 48.3 billion in 1999, more than ten times the amount invested in 1995. Traditionally, venture capital financing sources in the U.S. were concentrated at individual investors. A bill passed by the U.S. Congress in 1982 brought government departments and agencies into the process, increasing the effectiveness of results and thereby leveraging the process.

Romani [13] also points out the importance of venture capital in the development of technological base businesses, usually set up in incubators or technological parks. Such enterprises are characterized by their incorporation of scientific and technological knowledge as their main production input and by their close relationships with universities and R&D centers. The businesses located in the Silicon Valley are a classic example of technological base

enterprises, which have made use of the knowledge generated by Stanford and Massachusetts Universities and the great numbers of qualified available professionals, a result of the crisis suffered in the early 1970s by the area's large companies – including IBM, HP, Texas Instruments or Hughes.

#### **4. Strategic alliances as a supplement to internal innovative effort**

Internal R&D is a requirement for greater innovative competitiveness, but is not sufficient in itself. According to Bell and Pavitt [16] and Andreassi [17], the efforts of internal R&D and external R&D (technology services, technology acquisition, etc.) are supplementary, rather than substitutive. Which means that external alliances are important factors for a business to supplement its own internal R&D efforts and, as a consequence, achieve greater competitiveness in the markets in which it operates. Alliances may be of three different types [18]:

- Technology development alliances – designed to expand the R&D know-how and know-what of the firm to ensure that it keeps abreast of the state-of-the-art in the rapidly evolving field of knowledge relevant to its technological focus;
- Commercialization alliances – designed to provide the firm with and/or expand its manufacturing and marketing capabilities. These can include advanced development/clinical testing and production scale-up skills, together with those needed to steer a proposed new product or process through the regulative system;
- Financial alliances – designed to help provide the firm with the money

needed to support its technology acquisition and commercialization strategies.

As regards technology development alliances between small businesses and large companies specifically, Hull and Slowinski [19] noted that these can be advantageous alternatives to venture capital, since, in addition to resources, large companies can also provide know-how, credibility and access to a distribution chain, all of which can prove valuable in certain markets. For large companies, the advantage in associating with smaller ones lies in the inventive efficiency the latter sport as compared to the former. In addition, with the dynamism and heterogeneity of high-tech markets, it is difficult for large companies to dominate all market segments. Even companies operating in consolidated markets can improve their competitive edge by associating themselves with small businesses that can provide them with new product or process technologies.

Hull and Slowinski [19] also point out certain key-factors for an alliance between a large and a small business to work. The first is the construction of an effective communication channel, both between companies and internally in each of them. Other factor is a balance between the two companies as regards their influence over the decision making process. The most successful alliances have been those in which the businesses involved had active participation and involvement in the process. Finally, the authors also point out the importance of developing mutual trust between the companies for their relationship to be effective. On the other hand, an alliance's success lies in the fact that the partnership's objectives coincide with the strategic needs of both companies. Managers often focus on aspects of the alliance that have to do with their own

strategies, forgetting those that pertain to the partner's. In fact, the management of an alliance between businesses must be treated more as a process, demanding continuous attention from all the parties involved, than as an isolated event [20].

There is, however, dissent as regard the effectiveness of alliances. Smith, Dickson and Smith [21] raise a doubt over the notion that alliances between businesses can be an effective vehicle for long-term growth for small businesses. For these authors, while short-term benefits are evident, the problems arising from a long-term partnership can become a hurdle against the development of small businesses.

## **5. The government's role**

Schuetze [8] believes there is general consensus over the fact that the government is responsible for creating a structure to support private innovative initiatives and for interfering where market mechanisms fail. These arguments are especially valid as regards small businesses who cannot afford the risk and cost of R&D activities without some sort of governmental assistance. Therefore, the author suggests some steps for governmental support:

- Tax credits: tax credits for innovation usually apply to R&D activities, this being the reason why not all industries are able to use it. At high-tech industries, for example, it is easy to measure R&D expenditures and secure these credits. At more traditional industries, however, in which innovation is embedded in the engineering activity, companies still have doubts over how to use such incentives. Besides, governmental red-

tape, the complex process of filling-in the plans and forms required to secure the benefit and the difficulty in properly defining innovation and R&D end up keeping small businesses at bay.

- Grants and associated financial assistance: The main problem named by businesses who use this kind of support is the fact that lead-time involved for receiving a grant is such that, in many cases, when a benefit is secured, the innovation project has become obsolete and parts of it are no longer of use for the company.
- Support related to exports and to international business: as competition shifts from the local to the international scope, small businesses require support to operate in international markets, mainly through cooperation and alliances with companies that are active in foreign markets.

In addition, the government also plays an important role in encouraging patenting by small businesses, as the time and costs involved in securing such patents and the fear that the competition may gain access to the secrets of the innovation to be patented end in keeping small businesses at bay. However, as Rothchild [22] notes, securing a patent may be an invaluable tool for an emerging business to have enough breath to gain a foothold in the market, as was the case with Xerox and Polaroid, both companies that started out small and, through their patents, managed to serve large markets.

## **6. Final Points**

While the social benefits that arise from small businesses, such as employment positions created or the number of inventions, are largely known, the attention

devoted to the incentives mechanisms aimed at such businesses is still far from ideal. In most countries, the main focus of attention in terms of technological innovation is still on large companies. The purpose of this paper was to explore the topic, showing how innovation takes place in small businesses and how the flexible structure of these entities can contribute to the effectiveness of innovation. It also showed that, as a result of small businesses' fragility, it is important to have available support mechanism such as venture capital programs to favor innovation financing, encourage patents to protect inventions, encouraging strategic alliances as a means to empower small businesses in terms of marketing and management, and, finally, governmental mechanisms to encourage innovation.

Finally, it is worth noting that most small companies operate on scarce resources, and there is a temptation to cut fixed costs by eliminating expenditures on innovation. Therefore, it is also important to raise small businessmen's awareness over the importance of investing in innovation, as this is where the roots for the business's future competitiveness and survival lie.

## **References and Notes**

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Table 1: Advantages and Disadvantages of small and large firms. Source: Rothwell and Dodgson (1994)

ASPECTS	ADVANTAGES OF SMALL FIRMS	DISADVANTAGES OF SMALL FIRMS	ADVANTAGES OF LARGE FIRMS	DISADVANTAGES OF LARGE FIRMS
<b>Management</b>	Little bureaucracy; entrepreneurial management; rapid decision-making	Entrepreneurial managers often lack formal-management skills	Professional managers able to establish corporate technology strategies	Managers become bureaucrats and lack dynamism
<b>Communication</b>	Effective internal communication; informal networks	Lack of time and resources to forge suitable external S&T networks	Able to establish comprehensive external science and technology networks	Internal communication can be cumbersome; long decision chains result in slow reaction times
<b>Marketing</b>	Fast reaction to changing market requirements; can dominate narrow market niches	Market start-up abroad can be prohibitively costly	Comprehensive distribution and servicing facilities, high market power with existing products	Can ignore emerging market niches with growth potential
<b>Technical manpower</b>	Technical personnel well plugged in to other departments	Often lack high-level technical skills. Full-time R&D can be too costly.	Able to attract highly skilled specialists; can support large R&D laboratories	Technical manpower can become isolated from other corporate functions
<b>Finance</b>	Innovation can be less costly in SMEs: SMEs can be more 'R&D efficient'	Innovation represents a large risk; inability to spread risk; cost of capital can be relatively high	Able to borrow; can spread risk over a portfolio of products; better able to fund diversification	Shareholder pressures can force a focus on short-term profits.
<b>Growth</b>	Potential for growth through 'niche strategy' techno/market leadership	Problems in accessing external capital for growth; entrepreneurs often unable to manage growth	Able to obtain scale and learning curve economies through investment in production	
<b>Regulations</b>	Regulations sometimes applied less stringently to SMEs	Often cannot cope with complex regulations; often unable to cope with patenting system	Able to cope with government regulations; can fund R&D necessary for compliance	Regulations often applied more stringently to large companies
<b>Government schemes</b>	Many schemes have been established to assist innovation in SMEs	Accessing government schemes can be difficult. Lack of awareness of available schemes	Can employ specialists to assist in accessing government schemes.	Increasingly government innovation support has focused on SMEs
<b>Learning ability</b>	Capable of 'fast learning', and adapting routines and strategies			Slow to learn; often locked in to well-established practices
<b>Organization</b>	Generally simple and focused		Potential synergies across divisions	Generally complex; multidivisional, and increasingly multinational.
<b>Joint ventures strategic alliance</b>	Can prove attractive partner if technological leader	Little management experience; power imbalance if collaborating with large firms	Possess strategic managerial resources to enable the selection of appropriate partners	
<b>Supplier relations</b>		Can exert little control over suppliers	Can encourage innovative suppliers	