

DEPARTMENT OF MANAGEMENT

**Investigating New Technology Based Firm (NTBF)  
Internationalization: the Impact on Performance,  
the Process and the Antecedents**

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# **FACULTY OF APPLIED ECONOMICS**

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# **Investigating New Technology Based Firm (NTBF) Internationalization: The Impact on Performance, the Process and the Antecedents**

## **ABSTRACT**

While researchers have extensively studied the born global and international new venture phenomena, the related field of NTBF internationalization has been left untouched, giving rise to an investigation aimed at filling this gap in the international business literature. The investigation covers the impact that internationalization has on performance, the process of internationalization and the antecedents of successful internationalization. Being conceptual in nature, this paper lays the theoretical foundation for future empirical research on NTBF internationalization. The theory development is based on an analysis of several factors, including organizational and environmental characteristics, founders, financing, ownership and network ties of NTBFs.

## **KEYWORDS**

New Technology Based Firm; NTBF; internationalization; founders; financing

## **INTRODUCTION AND PROBLEM STATEMENT**

NTBFs are said to contribute significantly to the welfare of human beings, by inventing new technologies and by providing sustainable employment opportunities (Löfsten and Lindelöf, 2005). Due to the potential benefits that NTBFs bring into existence, it appears paramount to develop an understanding of the factors that are key to NTBF success. In the past, researchers have not regarded internationalization to be a success factor for NTBFs. As a result, the existing literature on NTBFs does not cover studies about the impact that internationalization has on NTBF performance. Such disregard might also explain why the process of NTBF internationalization as well as the antecedents of successful NTBF internationalization have so far been overlooked by researchers.

Contrary to past research, this paper hypothesizes that as a result of the specific organizational and environmental characteristics of NTBFs, survival chances may be greatly enhanced by pursuing international growth. Therefore, it will be argued that internationalization can be considered key to NTBF success. However, it will also be argued that from the point of view of the entrepreneur, a less desirable consequence of NTBF internationalization might arise, namely an increase in the risk of being taken over.

Seeking to fill the gaps in the existing literature, this paper develops a theoretical foundation that aims to explain the process of NTBF internationalization. Several studies exist that analyze internationalization processes of firms that are similar though not identical to NTBFs. Such firms include small knowledge intense firms (Bell, Crick and Young, 2004), small high-technology firms (Crick and Jones, 2000; Jones, 1999), high technology start-ups (Jolly, Alahuhta and Jeannet, 1992), small and medium-sized technology-based firms (Karagozoglu and Lindell, 1998), early-stage technology-based firms (Preece, Miles and Baetz, 1998), internationalizing high-tech small- and medium-

sized firms (Saarenketo, Puumalainen, Kuivalainen and Kyläheiko, 2004), international new ventures (Oviatt and McDougall, 1994, 1996), new venture firms (Zahra, Ireland and Hitt, 2000), born globals (Chetty and Campbell-Hunt, 2004; Knight and Cavusgil, 2004; Madsen and Servais, 1997; McKinsey & Co., 1993; Rennie, 1993; Sharma and Blomstermo, 2003) and global start-ups (Hordes, Clancy and Baddaley, 1995; Oviatt and McDougall, 1995). While some of the studies conducted on such firms offer valuable insights for the internationalization process of NTBFs, the findings of other studies help to clearly differentiate the investigation made in this paper from existing research. In particular, it will be argued that although NTBFs are not international from inception, they will internationalize rapidly once internationally experienced managers become actively involved in the business.

Linked to the lack of research about the process of NTBF internationalization, is the lack of research about the requirements that emerge during the international expansion of NTBFs. In order to fill this gap in the literature, the paper identifies the requirements that are likely to emerge during the internationalization process of NTBFs. This investigation is based on previous research about the above mentioned internationalizing firms that are similar though not identical to NTBFs. It is argued that the identified requirements play a vital role in explaining the antecedents of successful international expansion. In particular, it is argued that before the internationalization begins, NTBFs can increase the chance to internationalize successfully, by anticipating and working towards satisfying the requirements that are likely to emerge during the internationalization process.

The paper begins with conceptualizing NTBFs both through offering a definition and through outlining their specific organizational and environmental characteristics. Subsequently, a literature review follows that is made up of three parts. Each of the three parts concludes with hypotheses that are based on the empirical evidence and theoretical

reasoning identified through the literature review. The first part reviews the NTBF success factors identified by previous research. The second part reviews the internationalization processes of firms that are similar but not identical to NTBFs. The third part reviews the requirements that emerge during the internationalization process of firms that are similar but not identical to NTBFs. Final remarks include a summary of the theoretical foundation developed as well as an outlook on future empirical research aimed at validating the theory put forward.

## **CONCEPTS AND DEFINITIONS**

There has been considerable confusion around the concept of New Technology Based Firms (Rickne et al., 1999). Hence, this paper adopts the definition that a New Technology Based Firm is “a firm whose strength and competitive edge derives from the know-how within natural science, engineering or medicine of the people who are integral to the firm, and upon the subsequent transformation of this know-how into products or services for a market” (Rickne et al., 1999, p. 203). Since this definition only deals with the Technology Based part of NTBFs, the part concerning the Newness also needs to be defined. While some authors use the concept of New to refer to new versus old technology (Delaney, 1993; Manimala, 1994), this article is in line with other authors (Audretsch, 1999; Little, 1977; Rickne et al., 1999) who use the concept of New to refer to the age of the firm. Specifically, as suggested by several authors (Little, 1977; Rickne et al., 1999), New means firms that are no older than 25 years.

NTBFs are said to operate in innovative and technology intensive industries, such as electronic engineering, computer science, engineering physics, industrial economics, chemical engineering, mechanical engineering, civil engineering and medicine (Rickne et al., 1999). Such industries are considered relatively homogenous in terms of rapid

technological changes, product innovation, entrepreneurship, environmental uncertainty and high levels of competition (Karagozoglu et al., 1998; Preece et al., 1998). NTBFs are said to be well adapted to the high technology industries in which they operate, by possessing organizational flexibility, the ability to respond quickly and the ability to innovate (Chamanski et al., 2001b; Laamanen et al., 1996). Innovative capabilities may be fostered by the relatively high degrees of entrepreneurial dynamics and cultures that are seen to exist in NTBFs (Savioz et al., 2003). Moreover, high-technology start-ups such as NTBFs, are said to face relatively homogenous demand (Jolly et al., 1992).

Albeit the presence of the above mentioned commonalities, some authors reject the notion that NTBFs can be treated as a homogenous mass and therefore make a distinction between those NTBFs that are founded by academics and those that are founded by personnel from the private industry (Monck et al., 1988). However, research that distinguishes between NTBFs founded by academics and non-academics, shows that differences in terms of growth and profitability are insignificant between the two groups (Löfsten et al., 2005). Therefore, in this paper, NTBFs are considered homogenous in terms of being founded by scientists that might have spun-off from universities or from corporations. Moreover, such a unification is justifiable when considering that the common denominator of all NTBFs is to act as a mechanism for translating scientific knowledge into commercial products, by applying newly discovered technological breakthroughs to real life problems (Chamanski et al., 2001a). NTBFs are not only seen as a technology transfer channel between the world of research and the industry, but also between and within different industry clusters (Autio et al., 1998). Additionally, regardless to their background, all NTBFs are said to contribute significantly to the welfare of human beings, not only by inventing technologies that have the potential to improve living standards, but also by providing secure, high-quality and highly-skilled employment opportunities (Löfsten et al., 2005; Storey et al., 1998).

The key NTBF characteristics are identified as the following (Bank of England, 2001):

1. The value of NTBFs is dependent on their long-term growth potential which is derived from the quantity and quality of scientific knowledge and intellectual property they possess
2. In the beginning, NTBFs lack tangible assets that could be used as collateral
3. Initially, products developed by NTBFs have little or no track record, are largely untested in markets and are usually subject to high rates of obsolescence

## **LITERATURE REVIEW AND HYPOTHESES**

### ***NTBF Success Factors***

The following discussion represents a literature review on the success factors of NTBFs. It gathers scattered findings that when taken together, offer insights into the fascinating questions of why some NTBFs grow faster, generate higher profits, create more employment and introduce more new products than others (Chamanski et al., 2001a). This implies a focus on what Chamanski et al. (2001a) call the organizational-level success of NTBFs, measured in terms of profitability, number of employees and number of product launches.

New technology is the core business of NTBFs and technological advances and innovations are seen as their competitive edge and primary success factor (Beaver, 2001; Chamanski et al., 2001b). The innovative capability of NTBFs may be enhanced by giving rewards for successful innovations while refraining from penalizing employees for

innovations that have failed to deliver. It is argued that in order to gain and sustain a competitive position in the market, the NTBF attains a proper balance between its technology and business strategy, which are both considered to be NTBF success factors (Chamanski et al., 2001a, 2001b). While the technology strategy outlines the pursuit of technological advances through the development of competences and resources, the business strategy is mainly concerned both about the alignment of internal competences with environmental conditions and about the timing of market entry. This shows the complementary nature of both strategies and makes it clear that NTBF success is maximized if none of these two strategies is neglected (Chamanski et al., 2001b). However, the literature on the timing of market penetration is unclear. Some authors argue that NTBFs should introduce new technology as early as possible, in order both to generate cash-inflows that are needed to survive and to take advantage of the novelty effect (Schoonhoven, Eisenhardt and Lyman, 1990). Other authors argue that a later introduction reduces the uncertainty surrounding the market willingness to adopt the new technology (Schilling, 1998). Consequently, finding the right time to penetrate the market by balancing the two contradicting views on entry timing, seems to have a significant influence on NTBF success.

Since technological advances and new product innovations and introductions can only be realized through knowledge (Cohen and Levinthal, 1990; Drazin and Rao, 2002), knowledge management is considered crucial to successful NTBFs. Frequent knowledge acquisitions and continuous organizational learning imply that the knowledge base of successful NTBFs is structured and cultivated in a way that supports sustainable growth (Savioz et al., 2003). Managing knowledge effectively also involves making all required information readily available to every NTBF employee. Environmental intelligence –such as demand, supply, technology, competitive and regulatory changes– obtained directly from target customers, suppliers, trade fairs, business publications, government

organizations, research centers and consultants, enables the NTBF to predict, identify and respond to trends and developments in its competitive and technological environments, which is considered to be a success factor (Beaver, 2001). Obtaining such real-time information allows the NTBF to swiftly identify and capitalize upon feasible and profitable market opportunities. The process of obtaining this information can be greatly enhanced through an intelligence system that facilitates the acquisition, storage and retrieval of knowledge, by assisting people to scan and monitor the environment, analyze the information and improve communication as well as decision-making quality (Savioz et al., 2003). The continuous and speedy gathering of these information contribute to the success of NTBFs, because it facilitates the development of a strong market orientation and good internal communication (Beaver, 2001).

Research suggests that being located on a science park is an important NTBF success factor, because science parks are said to provide proximity to important customers, suppliers and researchers, allowing NTBFs to build networks that support their development (Löfsten et al., 2005). Löfsten et al. (2005) note that science parks channel benefits from central governments to NTBFs, by supporting R&D activities, the transfer of technology and its diffusion into industry. Other findings suggest that those NTBFs which are not located on a science park, have significantly lower growth of employment and sales turnover than NTBFs located on a science park (Lindelöf and Löfsten, 2002). Incubator facilities present on science parks, such as shared tenant services, local pools of venture capital, professional and technical networks and links to higher education institutions, are said both to reduce financial and non-financial barriers to new firm formation and to encourage the survival of existing technology-based firms (Westhead, Batstone and Martin, 2000). Moreover, science parks enable the NTBF to obtain small units with flexible leasing as well as offering the possibility to improve the image of the NTBF through the prestige of being linked to a higher education institute or research

center that is adjacent to the science park (Westhead and Batstone, 1998). Westhead et al. (1998) show that NTBFs are able to minimize direct personal costs associated with R&D, by utilizing the resources and skills of a higher education institute that is adjacent to the science park. Further evidence supporting the argument that being located on a science park can be considered a success factor, is offered by research indicating that successful NTBFs are those carrying out their R&D in close cooperation with external partners, resulting in faster product development cycles (Chamanski et al., 2001b). Such findings are complementary to Schoonhoven et al.'s (1990) view on market entry timing, in the sense that external R&D facilitates early market entry. Moreover, it is argued that strategic alliances may help small high-technology based firms to overcome financing and human resource shortages, to help building up manufacturing expertise and facilities, to help obtaining marketing and distribution resources and to overcome difficulties associated with rapidly exploiting new technology (Forrest, 1990).

Research has identified that NTBF management team size, functional and educational heterogeneity and tenure are positively associated with organizational success (Chamanski et al., 2001b). The study revealed particularly strong relationships during the market development phase between team size and NTBF success as well as between team heterogeneity and NTBF success. However, the observed relationships were not uniform across industries, in the sense that the functional heterogeneity of the management team was found to be more important for NTBF success in the electronics industry, while management team tenure was found to be more important for NTBF success in the computer science industry. Other NTBF management characteristics, such as the commitment, motivation and determination of the entrepreneur to initiate the innovation process are also seen as factors contributing to the success of NTBFs (Beaver, 2001).

Table 1

As can be seen from the preceding literature review, international growth has not been considered key to NTBF success. Nevertheless, some authors argue that in order to secure long-term survival, small and medium-sized technology-based firms as well as high-technology firms must be internationally competitive (Karagozoglu et al., 1998; Wright and Ricks, 1994), not at least because the sales volume generated in domestic markets is no longer sufficient to support competitive levels of R&D spending (Jolly et al., 1992; Kobrin, 1991; Preece et al., 1998). Similarly, Hordes et al. (1995) put forward the argument that a single market may not be broad enough to support the R&D, distribution, financing and marketing needs of a technology entrepreneur. Moreover, some findings suggest that an internationalization process which is part of the overall organizational strategy, might increase the financial performance of international new ventures (Oviatt et al., 1996). Preece et al. (1998) argue that in order to ensure survival in narrowly defined market niches, early-stage technology-based firms must pursue early international expansion. Empirical research has identified two further motives that would justify NTBF internationalization, namely greater strategic opportunities in foreign markets –such as market growth potential and cheap manufacturing– and inquiries from foreign buyers (Karagozoglu et al., 1998). Combining these arguments with the specific organizational and environmental characteristics of NTBFs, it appears that international growth is a major NTBF success factor. In fact, the relatively homogenous demand faced by high-technology start-ups (Jolly et al., 1992), implies that NTBFs are able to generate high sales volumes with minimum product adaptation costs, by serving customers in different countries. Moreover, both globalization and technological advances in communications technologies, production methods and logistics, are seen as reducing the transaction costs of foreign market expansion, thereby facilitating early internationalization (Knight et al., 2004).

However, due to the specific organizational and environmental characteristics of NTBFs, international expansion might expose NTBFs to a greater risk of being taken over by another company. In particular, due to the bank lending constraints caused by the lack of collateral, NTBFs might be forced to increase the amount of external equity financing in order to be able to raise the funds necessary for pursuing internationalization. Outside investors such as venture capitalists, might ask for control rights in order to be compensated for the high risk investment (Hellmann, 1998). The resulting loss of control experienced by the entrepreneur makes takeovers possible, because the outside investors can sell their stakes in the NTBF to another company. This problem becomes especially acute when highly innovative and flexible NTBFs are internationally successful and generate high rates of return, which makes them attractive takeover candidates. Moreover, since NTBFs usually operate in a global industry with global players, there can be a strong incentive for a large competitor to eliminate increasingly successful and growing competition. Such an increased takeover risk associated with rapid international growth might explain empirical findings (e.g., Kamshad and Hay, 1996) which suggest that a considerable proportion of NTBFs does not consider growth as desirable. In this respect, entrepreneurs might anticipate the increased takeover risk associated with rapid international growth and hence prefer to stay domestic and small, in order to protect their own position inside the NTBF.

Taken together, the above outlined empirical evidence and theoretical reasoning suggests the following four hypotheses:

Hypothesis 1: Internationally active NTBFs are more profitable than purely domestic NTBFs.

Hypothesis 2: Internationally active NTBFs employ more people than purely domestic NTBFs.

Hypothesis 3: Internationally active NTBFs launch more products than purely domestic NTBFs.

Hypothesis 4: Internationally active NTBFs are more likely to be taken over than purely domestic NTBFs.

### ***NTBF Internationalization***

**The process of NTBF internationalization.** It has been argued that in order to find the appropriate strategy to deal with the implications of globalization –mainly competitive rivalry (Brahm, 1995) and demand homogenization (Knight et al., 2004)–, a company has to identify both the extent to which the industry it operates in is global as well as the extent to which the company is prepared to act global (Solberg, 1997). Using Solberg's (1997) matrix, NTBFs are classified as operating in a global industry –caused primarily by a fast rate of technological change (Porter, 1985; Preece et al., 1998)– without initially being prepared to internationalize –due to risk aversion, limited financial and human resources and a lack of access to foreign distribution channels (George, Wiklund and Zahra, 2005; Hull and Slowinski, 1990; Roth, 1992). While Solberg's (1997) matrix advises NTBFs to prepare for a buy-out, this paper argues for internationalization strategies that avoid a buy-out. In this respect, NTBFs may be entering foreign markets using different modes of entry. Each mode can be seen as an internationalization opportunity that when being pursued, confronts the NTBF with specific environmental requirements.

Bell et al. (2004) has shown that small knowledge-intensive firms are unlikely to follow the internationalization process outlined in the Uppsala model (Johanson and Vahlne, 1977, 1990), which emphasizes the continuing increase in international involvement through gradually committing resources to markets at increasing distance

from the domestic base. Instead, due to the international nature of the market in which knowledge-intensive firms, born global firms, international new ventures and small high-technology firms operate, it is argued that these firms internationalize rapidly through simultaneously entering many foreign markets via a combination of exporting, licensing, joint ventures and foreign direct investments (Bell et al., 2004; Chetty et al., 2004; Crick et al., 2000; Jones, 1999; Oviatt et al., 1994, 1996). The exact choice of the foreign market entry modes of born globals is said to be dependent on the international market knowledge of the founders obtained through their network ties (Sharma and Blomstermo, 2003).

Since NTBFs operate in equally international markets, it is reasonable to assume that the internationalization process of an NTBF occurs equally rapid through the simultaneous pursuit of multiple modes of entry. Such rapid internationalization helps the NTBF to gain economies of scale (Saarenketo et al., 2004) needed to support competitive levels of R&D spending (Kobrin, 1991; Preece et al., 1998). Furthermore, Bell et al. (2004) suggest that foreign market selection and entry decisions of small knowledge-intensive firms are not influenced by geographical or physical proximity –as is suggested by the Uppsala model– but instead by relationships with clients and global industry trends, which offers confirmatory support for the previously mentioned motives for NTBF internationalization.

Similarly, several authors argue that due to the international experience of the founders, psychic distance becomes irrelevant during the internationalization of born globals and high technology start-ups (Jolly et al., 1992; Knight and Cavusgil, 1996). The following discussion will demonstrate that psychic distance is likely to also become irrelevant in NTBF internationalization, because internationally experienced managers –in the form of board members or venture capitalists– are likely to become actively involved in the management of internationalizing NTBFs.

Some of the small knowledge-intensive firms investigated by past research are likely to be international from inception and may therefore be termed international new ventures

(Oviatt et al., 1994, 1996) or born globals (McKinsey & Co., 1993; Madsen et al., 1997). Even though NTBFs can certainly be considered small knowledge-intensive firms that are likely to pursue rapid internationalization, they are not likely to be international from inception. Born globals and international new ventures are said to be founded by internationally experienced entrepreneurs, who see the world as one market, who have a global vision from inception and who have the ability to link resources from multiple countries to serve inherently international markets (Chetty et al., 2004; Jones, 1999; Madsen et al., 1997; Oviatt et al., 1995). However, NTBFs are usually not founded by internationally experienced entrepreneurs, but instead by scientists with high levels of technical expertise coming from local universities, local research laboratories or local subsidiaries (Bade and Nerlinger, 2000; Löfsten et al., 2005; Westhead et al., 1998), who lack the global vision and international management ability to enter the global market from inception (van Auken, 2004). Furthermore, it has been shown that the sudden internationalization of small to medium-sized firms, entailing big increases in capacity (i.e. going global), requires business network ties (Chetty and Campbell-Hunt, 2003) that are likely to be possessed by internationally experienced managers but not by scientists. Similarly, the missing business network ties of scientists result in a lack of international market knowledge that is needed for selecting the appropriate mode of foreign market entry, hence representing a barrier to NTBF internationalization. This finding is confirmed by research showing that the top-rated barrier to small and medium-sized technology-based firm internationalization is the difficulty to form international partnerships, closely followed by the lack of managerial experience and competence to exploit international opportunities (Jones, 2000; Karagozoglu et al., 1998). Moreover, in the beginning of an NTBF's life-cycle, the founding scientist is likely to be the majority owner as well as having an executive function in the NTBF, which is shown to result in managerial risk aversion that prevents immediate internationalization (George et al., 2005). Similarly, Bell

et al. (2004) found that family ownership is linked to a more cautious and reluctant internationalization approach. Research has shown that private investors usually provide funds for early-stage entrepreneurial ventures, while venture capitalists usually provide funds for late-stage entrepreneurial ventures (van Auken, 2002). George et al. (2005) demonstrate that once the NTBF obtains external financing through venture capitalists or institutional owners, risk aversion decreases and rapid international expansion might follow. At this point in time, NTBF internationalization might resemble born global internationalization, because venture capitalists are usually internationally experienced managers who have the global vision, the business skills and the business network ties required to pursue rapid internationalization. Therefore, even though NTBFs might not be considered international from inception, they may still be seen as new ventures that internationalize rapidly once internationally experienced managers become actively involved in the NTBF. Consequently, NTBFs seem to first operate in a domestic setting, before engaging in rapid internationalization.

#### Table 2

Taken together, the above mentioned empirical evidence and theoretical reasoning suggests the following three hypotheses:

Hypothesis 5: NTBFs are not international from inception

Hypothesis 6: NTBFs start internationalizing once internationally experienced managers become actively involved in the NTBF

Hypothesis 7: NTBFs internationalize rapidly through the simultaneous pursuit of different internationalization opportunities

**Requirements emerging during NTBF internationalization.** NTBFs pursuing an internationalization strategy are first of all required to find suitable foreign target markets, by gathering and analyzing extensive amounts of information about potential foreign

target markets. Knowledge about international markets and operations is seen as a critical determinant of superior international performance in entrepreneurial firms (Autio, Sapienza and Almeida, 2000). Foreign markets that qualify for being potential target markets are likely to have customer needs and regulatory standards similar to those of the domestic market, because in that case, product adaptation costs can be kept to a minimum (Jolly et al., 1992). In this respect, fellow member states of regional integrations such as the European Union, ASEAN and NAFTA might be attractive markets. Furthermore, the larger and the less competitive a foreign market is, the more attractive it may be for NTBFs to enter, because the profit potential is higher in large and less competitive markets.

Since international business network ties are said to be essential sources for the above mentioned knowledge requirements (Sharma et al., 2003), internationally successful NTBFs are obliged to identify and attract foreign partners and collaborators such as agents, distributors, licensees and joint venture participants. Moreover, it has been shown that internationalizing entrepreneurs use business and inter-personal relationships for gaining access to foreign markets, for exploiting foreign market opportunities, for directing the overall strategy of the firm and for transforming the firm (Harris and Wheeler, 2005; Walter, Ritter and Gemunden, 2001). The importance of network ties is further illustrated by the finding that leveraging foreign distributor competences is critical to international success, because foreign distributors are said to be able to provide early internationalizing firms with strong market knowledge and key foreign contacts (Knight et al., 2004).

Knowledge requirements are not limited to target markets and foreign partners. Instead, knowledge about global environmental transformations such as demand, supply, technology, competitive and regulatory changes in several different countries is required. Environmental intelligence is not only obtained from domestic but also from international

target customers, suppliers, trade fairs, business publications, government organizations, research centers and consultants. Karagozoglu et al. (1998) offer confirmatory support with their finding that small and medium-sized technology-based firms consider themselves disadvantaged compared to MNCs, in their ability to gather global environmental and competitive intelligence. Moreover, since international expansion involves increased funding needs, NTBF managers are required to know the value of all tangible and intangible assets, in order to be able to receive appropriate amounts of financing from external sources of funds. Further knowledge requirements include information about markets that offer NTBF-friendly conditions, namely well working labor, capital, products and services markets (Presa, 2000). Without NTBF-friendly market conditions the firm may either lack the financial or human resources to develop the new technology, or the regulatory environment may not permit the development or market launch of such technology, as is the case in countries that forbid stem-cell research.

All internationalizing NTBFs are required to have multilingual and culturally sensitive negotiation and management capabilities. Hence it is not surprising to find empirical evidence that suggests cultural distance as being a major barrier to small and medium-sized technology-based firm internationalization (Karagozoglu et al., 1998). As opposed to MNCs, NTBF management teams are usually not composed of people originating from different countries, hence making it more difficult for NTBFs both to adapt to foreign cultures and to build up trustworthy relationships with foreign partners.

An NTBF's international competitive success is said to require a high level of efficiency and effectiveness in managing R&D processes (Lefebvre, Lefebvre and Harvey, 1993). Therefore, NTBFs are required to concentrate on those R&D activities that are feasible and lucrative, in order to both minimize resource wastages and maximize potential future cash inflows. This implies the necessity to set up joint R&D activities and

R&D ties via research consortia, joint ventures and partnerships (Bell et al., 2004; Karagozogu et al., 1998).

The preceding analysis on the requirements that emerge during the internationalization process offers valuable insights into the antecedents of successful NTBF internationalization. In particular, it seems that NTBFs are more likely to succeed internationally, if they actively work towards satisfying these requirements already before the internationalization starts. This point is best illustrated by Sharma et al.'s (2003) finding that international market knowledge –a major requirement of internationalization– possessed by born global founders already before the initial foreign market entry, is used for selecting the appropriate mode of entry. Similarly, domestic NTBFs that engage in global environmental scanning might be better prepared to internationalize than domestic NTBFs that focus purely on domestic environmental scanning. Knowledge about the international business environment might enable the domestic NTBF both to swiftly identify foreign target markets and to more easily set-up international partnerships. Moreover, an early realization of the multilingual and culturally sensitive requirements might allow NTBF managers to acquire the necessary language and negotiation skills already before the internationalization process begins. Following this line of reasoning, the subsequent hypothesis is suggested:

Hypothesis 8: Domestic NTBFs that anticipate and work towards satisfying the requirements that will emerge during the internationalization process earn profits from their international activities earlier than domestic NTBFs that do not anticipate and work towards satisfying the requirements that will emerge during the internationalization process.

## **CONCLUSION AND FUTURE RESEARCH**

It has been shown that in the literature on NTBF success, internationalization has not been considered a key factor. In this paper, it is argued that due to the specific organizational and environmental characteristics, international growth can be considered a success factor for NTBFs. Hence, this paper reviews and complements the existing literature on NTBF success factors. However, besides the positive impact that internationalization might have on NTBF performance, there might also be a negative impact from the point of view of the entrepreneur. In fact, it may be that rapid NTBF internationalization increases the risk of being taken over. Such an increased risk might be due to greater external ownership and greater international exposure, both caused by the internationalization process. Whether or not NTBF internationalization is a key success factor and whether or not internationalization increases the NTBF's risk of being taken over, will in the future be studied empirically.

It has been shown that existing internationalization theories both concerning traditional manufacturing firms and concerning knowledge-intensive firms, are unable to explain NTBF internationalization. Therefore, in this paper a theory is put forward that aims to explain the process of NTBF internationalization. Insights into this process are obtained by looking at the internationalization theories of different but related firms. The theoretical reasoning leads to the hypotheses that although NTBFs are not international from inception, they will internationalize rapidly once internationally experienced managers become actively involved in the business. Therefore, NTBF internationalization seems to be distinctly different both from the Uppsala approach of gradually increasing international involvement and from the born global approach of immediate internationalization. In particular, NTBFs seem to first operate in a domestic setting, before engaging in rapid internationalization. An investigation carried out in the Japanese Pharmaceutical industry finds that such an internationalization approach –in which firms first develop technological capabilities in the domestic market before internationalizing–

results in superior performance (Penner-Hahn and Shaver, 2005), thereby reinforcing this paper's first proposition that internationalization is key to NTBF success. Future empirical research will be carried out with the aim of validating the claim that NTBFs are rapidly internationalizing firms that are not international from inception.

Apart from analyzing the process of NTBF internationalization and its impact on NTBF performance, this paper also identifies the requirements that emerge during the internationalization process of NTBFs. It is argued that these requirements play a vital role in explaining the antecedents of successful international expansion. In particular, it is argued that before the internationalization begins, NTBFs can increase the chance to internationalize successfully, by anticipating and working towards satisfying the requirements that are likely to emerge during the internationalization process. This proposition will also be tested through future empirical research.

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**TABLES**

Table 1 summarizes the key success factors proposed by the different authors and puts forward implications for NTBF management.

**Table 1**

<b>Authors</b>	<b>Key success factors</b>	<b>Implications for NTBF managers</b>
Beaver G 2001	Innovative capability; Knowledge management; Management commitment,	Initiate and promote entrepreneurial and innovative activities; Set-up routines and processes for

	motivation and determination	environmental scanning
Chamanski A & Waago S J, 2001	Innovative capability; Technology strategy; Business strategy; External R&D; Management team size, functional and educational heterogeneity and tenure	Give rewards for successful innovations while refrain from penalizing employees for failed innovations; Balance investments for activities outlined by the technology and business strategy; Carry out R&D in cooperation with external partners; Create a management team characterized by functional and educational heterogeneity
Forrest J E, 1990	Strategic alliances	Set-up strategic alliances for manufacturing, marketing and distribution activities
Löfsten H & Lindelöf P, 2005, 2002	Science park location	Locate the NTBF on a science park to benefit from proximity to customers, suppliers and researchers
Savioz et al., 2003	Knowledge management; Intelligence system	Structure and cultivate the knowledge base in a way that supports sustainable growth; Set-up an intelligence system that facilitates environmental scanning
Westhead P & Batstone S,	Science park location	Locate the NTBF on a science park to benefit from small units with

1998		flexible leasing and reduced R&D costs
Westhead et al., 2000	Science park location	Locate the NTBF on a science park to benefit from incubator facilities such as shared tenant services, local pools of venture capital and links to higher education institutions

Table 2 summarizes the types of internationalizing firms investigated by the different authors and puts forward implications for the internationalization process of NTBFs.

**Table 2**

<b>Internationalizing firm type</b>	<b>Authors</b>	<b>Implications for NTBF internationalization</b>
Born global	Chetty S & Campbell-Hunt C, 2004; Knight G A & Cavusgil S T, 2004; Madsen T K & Servais P, 1997; McKinsey & Co., 1993; Rennie M W, 1993; Sharma D D & Blomstermo A, 2003	Founders, organizational factors and environmental forces influence the timing and pace of the internationalization process; Psychic distance does not influence the decision on foreign market entry; Multiple markets are entered quickly; Business network ties determine foreign market entry mode
Early-stage technology-based firm	Preece et al., 1998	Although internationalization occurs early, global diversity requires more time and resources
Global start-up	Hordes et al., 1995; Oviatt B M & McDougall P M, 1995	Founders influence the timing and pace of the internationalization process
High technology start-up	Jolly et al., 1992	Psychic distance does not influence the decision on foreign market entry
Internationalizing	Saarenketo et al., 2004	Early and intensive internationalization

high-tech small- and medium-sized firm		to gain economies of scale
International new venture	Oviatt B M & McDougall P M, 1994, 1996	Rapid and early internationalization as part of an overall organizational strategy might increase financial performance
New venture firm	Zahra et al., 2000	Early internationalization and speedy market introductions
Small and medium-sized technology-based firm	Karagozoglu N & Lindell M, 1998	International orientation is crucial for long-term survival and growth; Founders and unique assets influence the competitive fortune in the international context; Internationalization due to opportunity-seeking
Small high-technology firm	Crick D & Jones M V, 2000; Jones M V, 1999	Internationalization is commonplace; Early and rapid international expansion is pursued through exporting, licensing and other service-based contracts; Founders, environmental factors and organizational factors influence the nature, timing and pace of the internationalization process; Global trends rather than psychic distance influence market entry decisions

<p>Small knowledge intense firm</p>	<p>Bell et al., 2004</p>	<p>Rapid internationalization through entering many markets simultaneously via exporting, licensing, joint ventures and foreign direct investments; Foreign market entry decisions influenced by relationships with clients and global industry trends</p>
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