THE ENTREPRENEURIAL PROCESS

IN A DYNAMIC NETWORK PERSPECTIVE:

A Review and Future Directions for Research[1]

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ABSTRACT

The main focus of this paper is on individuals and/or groups of individuals who create or seize a new technology-based or knowledge-intensive entrepreneurial opportunity. For this purpose, a theoretical framework for studying entrepreneurship, using financial, social and human capital, including social ties and networks, has been developed. Research themes or questions concerning how social ties and entrepreneurs' background affect the funding, launching and subsequent development of a new venture in high-tech or knowledge-intensive sectors are outlined. Also of interest here is how the presence or absence of important environmental factors, such as financing opportunities and involvement in a technology business incubator, can affect the success or failure of entrepreneurial efforts.

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After reviewing the existing literature, the paper concludes by presenting future research challenges and practical implications for organisations and individuals willing to take advantage of entrepreneurial opportunities.

Keywords

Competition, entrepreneurship, financial capital, human capital, incubator, internationalisation, risk theory, social capital, social networks, venture capital.

1. INTRODUCTION

Previous studies have addressed R&D issues, as well as innovation and technology management, primarily from the perspective of mature and large firms. Most firms in the European Union (EU), however, are SMEs (EUROSTAT, 1995). On average, SMEs account for 83% of a country's annual GNP growth (Reynolds et al., 1999; OECD, 1996), and may also account for the majority of jobs in an economy. In Denmark, for example, 69.5% of the workforce is employed in SMEs (EUROSTAT, 1995). There is increasing recognition of the importance of the positive correlation between the creation of small firms and the impact of SMEs on a country's annual GNP growth and employment level (Birch, 1981; OECD, 1996).

SMEs' importance for GNP growth and employment levels in national economies has also aroused interest in the processes by which new firms are established and their probability of success. In this light, a better understanding of entrepreneurs and their environment might be helpful, since these are usually key actors in the discovery and exploitation of new opportunities. Until recently, research investigating the founding of new businesses has mainly focused on the personal characteristics of entrepreneurs (Brockhaus, 1982). Following the original work of McClelland (McClelland, 1961), researchers have tried to list and describe the personality traits that identify successful entrepreneurs (Timmons, 1985). A main criticism of this approach is that it tends to underestimate the extent to which crucial skills can be acquired by learning (Deakins, 1996) and through previous failure in establishing new firms. A too narrow focus on personal characteristics can also divert attention from the environment the entrepreneur has to operate in (e.g. a country's economic policy, as well as its dominant social norms), and from other important structural and positional characteristics (e.g. social ties and networks).

There are numerous empirical studies of entrepreneurship, but these are seldom linked to conceptual schemes, typologies or theories. Moreover, only few of them specifically address R&D and innovation and technology in connection with the entrepreneurial phenomenon. This paper attempts to inject some order into the discussion of entrepreneurship by reviewing current issues and emerging trends, through (i) clarifying key terms typically used in entrepreneurship research; (ii) presenting a conceptual framework for assessing the entrepreneurial phases resulting in success or failure; (iii) surveying and critically evaluating representative studies according to the schemata provided (specifically, discussing research on technology- and knowledge-intensive firms, social network theory and the entrepreneurial process/stages); (iv) presenting implications for future research.

This review can be distinguished from earlier ones in that it tries to discuss and integrate research from a variety of disciplines, such as psychology, sociology, management and marketing.

The paper is organised as follows: Section 2 introduces definitions of the issues, and presents a general framework describing how the new knowledge-based entrepreneurial phenomenon is conceptualised in the context of this study. This includes a short introduction of the specific issues in the research. Section 3 formulates the main research hypotheses. Finally, Section 4 outlines some tentative conclusions and suggests implications for researchers and practitioners.

2. THE ENTREPRENEURIAL PROCESS

In this paper, entrepreneurship is defined as the act of establishing a new venture. This definition includes the separation from established firms (spin-offs), as long as the effort is recognisable as that of an individual and not as a corporate or entrepreneurial act. The initiating

entrepreneur is thus the person who has the idea for the venture and/or establishes the new business. While the definition neither excludes partnerships or other collective action nor the existence and importance of supporting entrepreneurs, the focus remains exclusively on the original initiator/s (Gartner et al., 1994). Attention is also focused exclusively on firms that to a significant extent depend on the development and/or application of scientific or technological skills or knowledge, as defined below. While important, issues regarding craft-based firms established for the sole purpose of self-employment are not discussed here.

2.1 New Technology-Based and Knowledge-Intensive Firms

As mentioned in the introduction, small firms are considered to be important catalysts for change and innovative efforts. In recent years, interest has also increased in how new technology-based small firms can help employment and GDP growth (Bollinger et al., 1983; OECD, 1996) in ever faster changing high-technology markets (OECD, 1999). Such firms are seen as businesses whose products or services are to some extent dependent on the application of scientific and/or technological knowledge (Allen, 1992). They can either use novel, advanced technology to provide a new product or service, and/or employ existing technology in an innovative way. The products of such a firm do not necessarily need to be technological, therefore (Allen, 1992).

Technology- or knowledge-based SMEs are often also high-growth SMEs (OECD, 1999). The literature suggests that technology-based, or knowledge-intensive, high-growth SMEs are created in various sectors of the economy such as biotechnology, computer technology, electronics, information technology, materials technology and telecommunications (Allen, 1992). While this paper focuses on such sectors, it will not specifically address small firms as such, being primarily interested in the entrepreneurial phenomenon. While all start-ups are bound to be small, some of them are likely to grow rapidly and become medium and large companies within a short time after their establishment.

In the following pages, we propose a causal model to show how social ties, the entrepreneur's background, and the surrounding institutional environment affect the funding, launching and subsequent development/growth of a new business venture. The factors included in the model are those believed to be important in understanding the entrepreneurial process, although their impact has so far been largely under-researched.

2.2 The Entrepreneurial Phenomenon and Its Environment

The entrepreneur is a key factor to understand how and why new organisations are established. Entrepreneurship as a function of this factor alone, however, is unable to fully account for the phenomenon of entrepreneurship (Thornton, 1999). Past research into how personality traits distinguish successful entrepreneurs from others has, in fact, had limited success (Brockhaus, 1982; Timmons, 1985).

A more recent strand of research emphasises the importance of external structural influences on the creation, selection and survival of new ventures. This is generally referred to as the "ecological" approach (Hannan, 1989; Aldrich, 1999), and is based on aggregated events at the population level of analysis. Because entrepreneurial innovation is largely a function of existing infrastructure at the industrial level, the ecological approach has been criticised by some authors (e.g. Van de Ven and Garud 1989).

According to Shane and Venkataraman (2000), the choice of exploitation mode depends on the nature of the industrial organisation (financing, first-mover advantages, low barriers to entry), the opportunity (uncertainty prevails) and the appropriability regime (property and patent laws).

In addition to the influence of existing infrastructure on entrepreneurial development, Reynolds (1991) has also suggested an extensive set of social networks as an important prerequisite for

starting a successful new venture. Similarly, the existence of venture capital, business angels or incubator regions and structures (i.e. Technology Business Incubators) are elements that have all been put forward as essential ingredients in an entrepreneurial start-up (Thornton, 1999). This suggests that both personal and business networks, as well as the institutional and social environment in which the entrepreneurial process takes place, need to be taken into account.

2.2.1 Technology Business Incubator (TBI) Ventures vs. Others

As indicated above, TBIs might have some effect on the launch of a firm and during its pre-growth phase. High-tech or knowledge-intensive firms are in fact likely to be more risky ventures than traditional businesses (Allen, 1992), and might therefore benefit from the initial support of a specialised institutional setting. Moreover, such firms are usually unable to quickly generate revenue, and their success is difficult to predict (Allen, 1992). To reduce the risks, while at the same time helping entrepreneurs launch new firms, governments and private entrepreneurs have introduced various initiatives, including the establishment of TBIs that help obtain and/or provide seed funding and advice (Bollinger et al., 1983)[2]. The literature highlights the importance of TBIs in helping to reduce some of these risks while improving the chances for success (for an extensive review, see Mian, 1997).

Apart from providing start-ups with building space in physical proximity to other firms, a TBI can also give the new firm the opportunity to lease or rent space below market rates, though our pilot study challenges this. Moreover, certain facilities, such as reception and canteen services, can be shared between several firms, thus further helping to reduce costs (Miller and Cote,

[2] In Denmark, TBIs take the form of *Innovationsmiljøer* (Innovation Centers) and *Forskerparker* (Science Parks), respectively.

1987; Mian, 1997). Just as important may be that a TBI can also offer financial, human and social capital in the form of, for example, managerial and legal know-how (Mian, 1997).

Table 1 outlines the above in a more formal structure. At the moment, there is nothing in the literature about TBI-sponsored and non-sponsored firms' chances for success (Bugliarello, 1998). In Denmark, recent studies commissioned by the government to investigate the performance of local TBIs have focused exclusively on firms established within such environments (Erhvervsfremmestyrelsen, 2000). However, the literature stresses that measuring these effects is difficult, and that TBIs have not always been as successful as expected (Mian, 1997).

Table 1 suggests that, in order to better understand the importance of the support provided by TBIs, it might be helpful to look at firms that have benefited from TBI resources vs. others. For example, if TBIs are successful in reducing the risk of high-technology ventures for subsequent investors (e.g. Allen, 1992), TBI-supported or related start-ups should do better in the entrepreneurial tournament (see Hypothesis 2.3 and 3.2 in the following sections).

2.3 Growth, Success, Failure and Other Outcomes

The above suggests that the existing infrastructure, and the personal characteristics and social ties of entrepreneurs play an important part in the foundation of a new business. However, the literature also suggests that the success, failure or other outcome (e.g. a take-over) of a new venture can be explained by organisational and environmental factors. Research shows that, among other things, strategic factors influence the performance and possible survival of new ventures (cf. Liebermann and Montgomery, 1988). For example, an entrepreneur and/or manager must decide where to locate the new venture in order to obtain a competitive

advantage (Besanko et al., 1996). However, not all competitive advantages and entrepreneurial opportunities are immediately apparent to everyone, which results in an asymmetry of beliefs about opportunities (Hayek, 1945).

An entrepreneur is expected to have special insights, or to possess special information, which enable him/her to discover and explore entrepreneurial opportunities which others either fail to see or mainly see a risk of failure. This by no means implies that entrepreneurs never fail. On the contrary: the creation of new firms has always been accompanied by the death of others - what is generally referred to as "creative destruction" (Schumpeter, 1939), or simply "business dynamics" (Reynolds et al., 1999). Traditionally, economic growth is accompanied by company turbulence or "churning" (Reynolds et al., 1999). It is evident, however, that the likelihood of discovering entrepreneurial opportunities must be influenced by various factors. We propose that human and social capital are useful theoretical stepping-stones to a further understanding of the entrepreneurial phenomenon.

While the above indicates that the failure of new ventures is part of the entrepreneurial tournament, research on new ventures seems to be biased towards successes (Shepherd, 1999). However, the past experience of an entrepreneur, including experiences from failed ventures, can be invaluable to the success of new ventures.

In order to further our understanding of the entrepreneurial process, failures will also have to be included in the study of entrepreneurship. Our research will explicitly address this issue by following entrepreneurs after the failure of their initiative, and by controlling whether and to what extent previous experiences of failure influence the establishment and success of new entrepreneurial attempts.

2.4 Towards the Development of a Causal Model of Entrepreneurial Success

As discussed earlier, entrepreneurship is influenced by many different factors, and will result in successes as well as failures. Entrepreneurs starting new knowledge-intensive or technology-based firms are often scientists, or have a scientific or technical background and some prior business experience in technology-related sectors. Frequently, they are also the inventors of the new product (Roberts, 1991). The following section presents a framework for identifying the key factors affecting entrepreneurship, which are also included in this study (Figure 1).

Insert Figure 1 about here

Figure 1 illustrates how various factors, such as **social, human and financial capital**, as well as the **characteristics of the market**, contribute to the success of an entrepreneurial venture. The figure is divided into two levels of analysis. The first level focuses on the entrepreneur as an individual social actor, while the second concerns the newly established firm. During the early stages of a new venture's development, the characteristics of both the entrepreneur and the market are likely to be the best indicators of the firm's success and early growth. Later on, however, the firm is likely to become increasingly independent of the entrepreneur, in part because s/he will typically give up part of his control and ownership of the firm to obtain new financial capital. At this stage, the firm's success is likely to become an additional, independent factor for access to new funding opportunities.

An entrepreneur's social capital consists of all the social relationships and social structures that can be used to achieve his goals. Social capital is the result of a dynamic interaction, and is potentially present in all non-conflict-based social relations. However, it only becomes "capital" when it is used by actors in concrete situations (Coleman, 1990; Pizzorno, 1999; Portes, 1998). Individual social capital consists of the set of social relations (social ties) surrounding the actor – in our case, the entrepreneur – that can more or less be consciously mobilised when needed. The person's gender, age and family background are generally expected to influence the number

and type of social ties. For example, a person with extensive business experience will have access to people with special know-how, while a graduating student is likely to lack such contacts (Campbell and Heffernan, 1981). These social relations (or ties) can be private or business-related (cf. Figure 1).

Collective social capital is the result of all social interactions and relations that take place, or have taken place, in a given society. Social capital gives rise to what is defined as the "institutional environment." For example, Maurice et al. (1980) found in their study that organisational processes develop within an institutional logic that is unique to a society. This institutional logic includes norms and values, as well as the interpersonal trust level. Trust is defined as confidence in others' moral integrity or goodwill in dealing with unpredictable issues (Ring and Van de Ven, 1994).

Collective social capital is also "structural embeddedness," which implies that the entrepreneur's position may affect the possible success of a new venture. Varying levels of and unique access to collective social capital, e.g. via the support of a TBI's facilities and resource network, can give rise to a particular set of economic opportunities. The latter help explain different behaviours in response to seemingly identical environmental uncertainty (Burt, 1992).

We define human capital as resulting from the experience and educational background of the entrepreneur (see also Figure 1). Experience and education can be general, or related specifically to the business sector and entrepreneurial activity. In this sense, the number of years, as well as level and type, of education, including courses and languages, are part of the human capital at the disposal of the entrepreneur. Again, also in this case, age, gender and socio-economic background of the family of origin are likely to influence the educational and professional opportunities and choices of future entrepreneurs.

According to Figure 1, financial capital can be made up of personal and general funds. Personal funds can be sweat equity (i.e. time invested by the entrepreneur without getting paid), an entrepreneur's own funds, and help from family and friends, as well as bank loans based on personal collateral. Other capital might include seed funding from a development agency, government–backed loans, or funds from a venture capital (VC) firm (Shepherd, 1999).

All three types of capital - social, human and financial - are assumed to be related to each other, as shown in Figure 1. For example, social capital in the form of contacts to certain resource centres (e.g. government agencies) may help securing external funding. Later on, the firm's success might allow the hiring of the new human capital needed to increase the probability of success, thereby creating additional individual and social capital.

An entrepreneur may decide to launch a new venture if s/he has the human, social and financial capital needed to start a firm. If not, s/he may decide that additional financial or human capital is needed first, and try to get another partner and more financing in order to launch or expand the firm. Social, human and financial capital thus come into play both before the launch and during the various initial phases of a new firm.

The model in Figure 1 outlines a causal model to be tested after a subsequent data collection phase. Human, social and financial capital, together with the type of company and characteristics of the market, constitute the four main factors or latent variables influencing the success of new ventures. A new venture's success is defined first and foremost as its survival, and secondly as its growth. Growth might be measured through different indicators, such as an increase in the number of employees, or the firm's capital, sales, revenue, profit and so forth. For this research, various measures of growth will therefore be combined in an overall index of growth.

Internationalisation is seen here as a “split variable”. In other words, since internationalising and non-internationalising firms are likely to follow different paths of growth, and the definition of growth itself might need to be different for the two kinds of enterprises, they will be treated separately.

Various authors have proposed different phases through which entrepreneurs are supposed to pass in the process of establishing new ventures (Wilken, 1979; Roberts, 1990; Roberts, 1991; Gattiker and Ulhøi, 2000). For the purposes of this research, these have been summarised into two generic stages, namely the *pre-growth/development stage* and the *first growth phase of entrepreneurship* (cf. Table 1).

During the “development stage”, initial problems have not yet been overcome, and the firm is typically dependent on either the support of an incubator environment, other institutions, or persons providing resources at low cost, such as partners working without salary in their spare time (“sweat equity”). Some entrepreneurs may still be working for the source organisation, such as their previous employer. Thus, the source organisation, which in the case of technology or knowledge-intensive firms is likely to be a university or research centre or unit, may allow the entrepreneur to exploit various resources in order to carry out R&D (Roberts, 1991). At this stage, entrepreneurs might also rely on private resources, e.g. personal savings or loans from friends or family. A bank loan may be guaranteed by personal collateral (Roberts, 1991). Since it is often difficult to predict the potential for success of high-technology firms, this makes them less attractive to venture capitalists than conventional businesses (Allen, 1992).

Previously used resources should have culminated in technology assets. Resources can have been used to draw up a well-developed business plan, produce a working prototype, or obtain a patent. Receiving resources and commitments requires trust. Better technology assets can be interpreted by investors as the additional information they need to reduce risk (Rosen and

Olshavsky, 1987) and negative prospects. Finally, providing important information to investors should also increase trust in a project by helping them to reduce their risk perception (McNamara and Bromiley, 1999; Ring and Van de Ven, 1994).

Once the firm has survived the initial establishment phase, it is expected to enter its first growth phase. Growth may result in the enterprise leaving the incubator environment if it was launched in such an environment. These types of enterprise are likely to be 2-3 years old (Gattiker and Ulhøi, 2000). However, some data suggest that new technology-based firms might stay in the incubator for up to 3-5 years (OECD, 1997).

3. RESOURCES AND ENTREPRENEURSHIP

Figure 1 illustrates a causal model of the entrepreneurial process.

The relationships shown need testing, and the subsequent findings may lead to modifications of the proposed model. Nevertheless, we have put forward a number of research hypotheses based on this model and the literature review above. In the following sections, we will discuss the factors supposed to influence the entrepreneurial process - human, social, financial capital, and the main issues related to technology and market characteristics - in more detail.

3.1 Human capital

Figure 1 suggests that human capital consists of specific (e.g. industry experience) and general (e.g. length of education) human capital. Entrepreneurs have different educational and professional backgrounds, and these are likely to have a strong influence, in terms of competitive advantages and disadvantages, on the process of starting a new business (Roberts, 1991).

Differences in human capital might be distinguishable based on the entrepreneur's background, e.g. academia, business and venture capital firms or investors (Allen, 1992).

Academics, for example, are likely to have a strong technical and/or professional background, easy access to R&D facilities, and perhaps also a clear idea about the present and future needs of the market. Moreover, they might have a variety of important connections (personal and institutional networks). However, they are likely to lack crucial managerial skills, including the ability to envision practical applications of their own ideas and the necessary managerial and market experiences. Academics are also generally aware of the importance of protecting intellectual rights, particularly when external sponsorship is involved (Allen, 1992). This is at least true for natural scientists, engineers, and others with similar backgrounds.

Entrepreneurs coming from the industry are likely to know how to transform innovative ideas into marketable products. In addition, they might have a good insight into the business world, clear ideas about what is needed for the success of a new business, and personal ties to business people with important skills (Gattiker and Ulhøi, 2000). Some have also suggested that a distinction should be drawn between novices and 'average' or 'typical' entrepreneurs and experienced founders. The habitual entrepreneur starts new businesses and usually moves on after a few years (McMillan, 1986).

Entrepreneurs with experience in venture capital firms might have important connections to possible sources of financial capital, but lack technical and managerial skills.

Entrepreneurs' educational and professional experiences directly related to their new venture are sometimes referred to as "specific human capital" (Cressy, 1999). These experiences might be very important for the success of a new venture. When evaluating the probability of an entrepreneur's success, therefore, it is important to take previous experiences into account, e.g.

whether they attended business or technical schools and courses, or have already established a firm (Starr et al., 1993). Based on the above, we now propose the first hypothesis:

> *Hypothesis 1.1****: The growth of new ventures (e.g. employment, sales, revenue and profits) will be positively affected by entrepreneur(s) with critical competencies and specific human capital, such as:***
>
> ***a) technical (e.g. science education)***
> ***b) managerial (e.g. habitual entrepreneur)***
> ***c) market-related areas (e.g. experience in same industry)***

The success of a new venture might also be influenced by "general human capital" (Cressy, 1999), which we define as consisting of length of education, previous work experience in other sectors, and knowledge of languages that may ease or foster the early establishment of international connections (see section 3.4).

All the above elements can contribute to the ability of the entrepreneur to discover new opportunities and find the best way to take advantage of them. The above suggests testing the following hypothesis:

> *Hypothesis 1.2****: The growth of new ventures (e.g. employment, sales, revenue and profits) will be positively affected by entrepreneur(s) with general human capital, such as:***
>
> ***a) a higher academic degree***
> ***b) other professional experiences***

Age, gender, and other socio-economic background variables can also influence the formation of general, as well as specific, human capital. For example, previous studies report that women face disadvantages in the entrepreneurial tournament, which in some cases affect business growth negatively (Moore and Buttner, 1997). Moreover, women tend to choose certain types of educational institutions or courses that do not help them develop the kind of human

capital required to be a successful entrepreneur. This choice might also exclude them from important social networks.

Cressy (1999) found in his study that age, understood as “owner’s maturity”, affects a new venture’s possibility of success and growth positively through the impact on the increased human capital.

Again, having successful entrepreneurs in the family should help the individual secure the human and social capital needed to succeed (Beyers et al., 1998).

All these elements can affect the entrepreneurial attempt directly and/or indirectly. In particular, they might affect the ability of the entrepreneur to select an effective managerial team, obtain initial and seed capital, establish useful personal and institutional contacts, and discover opportunities for expansion in foreign markets (Reynolds and White, 1996). This results in the following additional hypothesis:

*Hypothesis 1.3****: The growth of new ventures (e.g. employment, sales, revenue and profits) will be indirectly, positively affected by entrepreneur(s) who are:***

a) ***male***
b) ***older***
c) ***from a family of entrepreneurs***

3.2.Social Capital

As Figure 1 indicates, social capital consists of individual and collective social networks, ties and structures that help the individual get access to information and know-how. According to Aldrich and Widenmeyer (1993), social ties connecting entrepreneurs to resource providers (e.g. other entrepreneurs and knowledgeable individuals) facilitate the acquisition of resources and the exploitation of opportunities.

Social ties can be strong or weak. Supporters of the weak-ties hypothesis argue that these are more effective means for knowledge-sharing. A person who belongs to a social network with weak ties is more likely to gain access to new information than if he was exclusively surrounded by strong ties (Granovetter, 1973, 1974). In order to obtain information and establish business relations, the entrepreneur needs to be in contact with other persons who can provide complementary knowledge and resources (Johannisson, 1988; Larson, 1991; Bollinger et al., 1983). These persons are likely to be accessible, directly or indirectly, through private or business-related ties.

In the literature, weak ties have often been associated with the generation of ideas, whereas strong ties tend to be related to problem-solving (Leonard-Barton and Sinha, 1993; Henderson and Cockburn, 1994; Eisenhardt and Tabrizi, 1995; Hansen, 1999). Unfortunately, it is still unclear precisely how weak social ties come into play in new technology- or knowledge-based firms. However, innovation literature emphasises the fact that close and frequent social interaction between relevant internal groups and functions during the internal development process improves the effectiveness of the innovation process (Ebadi, Utterback, 1984; Leonard-Barton and Sinha, 1993; Henderson and Cockburn, 1994; Eisenhardt and Tabrizi, 1995). We therefore propose to test the following hypothesis:

> *Hypothesis 2.1****: The growth of new ventures (e.g. employment, sales, revenue and profits) will be positively affected by entrepreneurs with access to a social network made up of weak ties.***

In addition to weak social ties, strong ties based on personal relationships may also play an important role for an entrepreneur. Hu and Kronelliussen (1997) write that personal ties result in improved company performance. Support, knowledge, and complementary resources can be acquired through such ties, which lead to social co-operation between key players (e.g. Johanson and Mattsson, 1987). Powell (1990) attributes success in inter-organisational relations

to sentiments of friendship and a sense of diffusing personal obligations (social contracts) which arises between people involved in exchange relationships.

Beyers et al. (1998) suggested that researchers should focus attention on "other people" with "whom the entrepreneur spends time and how they respond" (p. 1-5). In turn, this will permit the study of how social networks help the individual to obtain vital input in the competition for scarce resources. This suggests that the following hypothesis should be tested:

*Hypothesis 2.2****: The growth of new ventures (e.g. employment, sales, revenue and profits) will be positively affected by partners having strong social ties amongst:***

a) ***each other, and***
b) ***with co-operating parties (e.g. board members and investors).***

As pointed out earlier, institutions and interpersonal contacts constitute what we refer to as "collective social capital". They can either hinder or support the entrepreneur's efforts to mobilise additional resources for the venture. Being supported by a TBI or related/located at a TBI represents social capital that, in turn, should help reducing the perceived risk of a project from an investor's perspective (Bugliarello 1998). Moreover, the access to TBIs may result in the TBI providing the firms with access to seed money and other support. Accordingly, a new venture's success could be influenced by a TBI in several ways. Direct influence could be exercised through the funding of the new venture, or the distribution of financial capital (Bugliarello 1998). Active participation of the TBI in the project's development (e.g., writing business plan and assessing market potential) or being involved in the management of the firm after its establishment, would instead represent forms of indirect contribution through the delivery of additional human capital, e.g., finding a manager (Mian 1997).

In other words, TBIs can offer the entrepreneur an indirect contribution in terms of business and advice ties (social capital). These ties can be established with consultants, with other entrepreneurs or with investors (e.g., Hu & Kronelliussen 1997). Hence, we propose the following hypothesis:

> *Hypothesis 2.3**: The growth of new ventures (e.g. employment, sales, revenue, and profits) will be positively affected by entrepreneurs with access to a TBI's resources (e.g. financial, social and human capital).***

3.3 Financial Capital

Financial capital is an important strategic asset, which is needed for the foundation, survival and growth of any new venture. The search for external capital (investors) is likely to be the activity that takes up most of the time of new as well as established entrepreneurs. This means that, while financial capital is an important factor in the entrepreneurial process, it is also an intermediate goal on which other resources are spent, especially human and social capital.

New technology- or knowledge-based firms have distinctive financial needs during their various evolutionary stages. The pre-company stage, where laboratory and other facilities of a "source-organisation", or the basement of the entrepreneur's own house, often fulfil the need for financial capital, is followed by the pre-growth or development stage. In this stage, the company still often lacks an operating prototype, and has not yet worked out a very well developed business plan - if it has one at all. Here, the risk is still substantial, and unless seed funding is provided by a TBI, it can sometimes be difficult for the venture to get established (Bugliarello, 1998).

Shane and Venkataraman (2000) note that, even when exploring an opportunity, uncertainty prevails and the venture may fail. Financing is thus affected by the potential risk inherent in any new venture (Gattiker and Ulhøi, 2000). Since the future success of new technology- or knowledge-based firms is difficult to predict, and such ventures are more risky than traditional businesses, obtaining capital may be particularly difficult (Allen, 1992).

According to risk theory, risk assessment is based on the individual's perception of the likelihood of loss associated with an investment decision (Kahneman and Tversky, 1979; McNamara and Bromiley, 1999). Perceived risk is associated with a need to identify and measure the risk(s) an entrepreneur or firm is exposed to, and to what extent (Hodder, 1999). Risk aversion, in turn, is strongly influenced by whether or not trust exists between the actors involved. Studies have shown that, when individuals evaluate situations associated with risk, there is a positive relationship between risk and return and a negative relationship between risk and loss (Kahneman and Tversky, 1979).

However, if positive prospects are associated with a risk decision, and they are not significantly different from ones associated with the non-risk choice, people will opt for the non-risk choice (Gottfries and Hylton, 1987; Kuehlberger et al., 1999). Moreover, the more complex the technology, the more difficult the risk assessment procedure for potential investors. Investors will therefore prefer less risky choices (Philpott, 1994) that require less funding, thereby reducing the negative prospects of the loss of their investment (Kahneman and Tversky, 1979).

In traditional organisations, complexity of technology may require radical changes in users' habitual behaviour, thereby making its adoption and diffusion more difficult to assess and predict (Gattiker, 2000) for potential investors.

Moreover, complex technologies tend to require heavy investment before a prototype is ready to go to the market.

This leads to the following hypothesis:

*Hypothesis 3.1**: Obtaining capital or financing for projects/firms is negatively affected by trying to obtain funding for (relatively):***

a) ***complex technology requiring***
b) ***heavy investment.***

Investors' perceived risks of a venture's possible success may also be influenced by the characteristics of the firm and its development. Potential investors' will, for example, be more likely to trust a project if the entrepreneur has invested his own capital (human, social or financial) in it. This will give investors the impression that the entrepreneur has the goodwill and moral integrity needed to deal with unpredictable events and situations (Ring and Van de Ven, 1994). In other words, the risk perception of potential investors can be softened if entrepreneurs have already invested their personal capital and time (i.e. 'sweat equity') in the project.

If, therefore, an entrepreneur has spent his time developing a comprehensive business plan or product prototype at an early stage in the project, risk perception should be reduced (Deakins, 1996) and the likelihood of obtaining capital should increase. This leads to the following hypothesis:

*Hypothesis 3.2**: Obtaining capital or financing for projects/firms is positively affected by previously having***

a) ***invested private funds and/or sweat equity***
b) ***obtained seed money (e.g. government, TBI or other)***

In general, high-tech entrepreneurs have proved unwilling to give up control in the first stages of new ventures (Philpott, 1994). However, entrepreneurs may have to give up part of their equity, depending on how investors perceive the risk. Risk perceptions are affected positively by several

factors, thereby reducing the percentage of equity and control that entrepreneurs might have to give up in order to obtain capital.

Among other things, technology assets can influence the total amount of equity to be invested in a new venture as well as the percentage of equity remaining to the entrepreneur. For example, while the overall amount of equity or capital can rise rapidly with additional investment, the entrepreneur's share might actually be reduced (i.e. s/he is left with a smaller piece of a larger cake). In contrast, the entrepreneur can increase his share of the equity if important milestones are reached, thereby ensuring new capital while at the same time investors reduce their share (Gattiker and Ulhøi, 2000).

Success paired with rapid growth during the first few years requires additional equity and risk capital, which, in turn, will often push the entrepreneur's ownership below 50% (e.g. Beyers et al., 1998; Gartner et al., 1994). An entrepreneur can have invested sweat equity and own capital beforehand (Deakins, 1996), however, which can have a positive effect on the valuation of the firm for parties considering investments. This leads to the following hypothesis:

*Hypothesis 3.3****: Entrepreneurs seeking capital/financing or venture capital will retain a larger share of the equity if:***

a) ***they have invested their own capital and time in the project***
b) ***a functioning prototype exists and/or property rights can be secured***
c) ***(e.g. patent)***

3.4 Internationalisation of high-tech start-ups

As discussed above, internationalisation is a characteristic path of development for some firms. Research has found that most of the conventional companies in traditional industries that

internationalise at some point in their development tend to act in accordance with the so-called "stage theory." According to this theory, firms internationalise in a slow and incremental manner, increasing their internationalisation if and when they gain the necessary experience and knowledge. In recent years, however, new technology-based or knowledge-intensive firms show an increasing tendency to be "born global," by which is meant that they start interacting globally shortly after their launch (Jolly and Alahuhta, 1992; Madsen et al., 1999; Vahlne, 2000).

Research into technology-based firms indicates that rapid internationalisation has a positive effect on growth (Bell, 1995). Of particular interest here is how the entrepreneur's human and social capital helps the firm to expand beyond domestic markets. Research also suggests that living abroad, and having first-hand knowledge of foreign markets and business opportunities due to previous working experiences, helps a person succeed in other businesses with internationalisation activities (Burgel and Murray, 1998).

The above suggests that specific human capital, such as work experience abroad and knowledge of other languages, should help a new venture to expand into foreign markets. To the best of our knowledge, such research on new technology-based or knowledge-intensive firms is lacking, which suggests the following hypothesis:

> *Hypothesis 4.1****: Success in the internationalisation of a technology-based or knowledge-intensive firm will be positively affected by entrepreneur(s) with critical competencies and specific human capital, including having:***
>
> ***a) worked abroad***
> ***b) studied abroad***
> ***c) knowledge of foreign languages***

Moreover, the establishment of personal or business-related international connections might ease expansion in foreign markets, due to the information gained through social ties (see section

3.2). In fact, though, as previously mentioned, there is no general agreement among authors about the relative importance of weak and strong ties with regard to either employment and mobility (Granovetter, 1974; Burt, 1992), or entrepreneurship (Light, 1984; Light and Bonacich, 1988), there is little doubt that social ties and social capital are among the most important vehicles of strategic information. This is especially true for situations where actors enter "unknown territory", such as new jobs or markets. This leads to the last hypothesis:

> *Hypothesis 4.2:* ***Success in the internationalisation of a technology-based or knowledge-intensive firm will be positively affected by entrepreneur(s) with critical international, personal or business-related social relations (ties).***

4. CONCLUSIONS AND IMPLICATIONS

A first important conclusion that can be drawn from the literature reviewed in this paper is that, in the fields of entrepreneurship, strategy and social networks, there is a limited cross-feeding and integration of research results. Such a limited exchange of ideas across disciplines is a stumbling block to our understanding of entrepreneurship and of how individuals exploit entrepreneurial opportunities. We therefore argue, along with Blalock (1984), that, to better understand how people use social, human and financial capital in the entrepreneurial tournament, researchers should adopt an interdisciplinary approach.

New technology- and knowledge-intensive firms contribute greatly to the economic success of a country, both in terms of exports, employment, innovation, and R&D. This is widely recognised (Bollinger et al., 1983), and governments are trying in various ways to foster the development of such firms. However, efficient measures can only be developed based on a thorough understanding of the complex dynamics underlying the entrepreneurial process in this

sector. Moreover, a greater awareness of the factors which facilitate or hamper the discovery and exploitation of entrepreneurial opportunities, and of the various phases through which the entrepreneurial process passes, might help entrepreneurs develop more advanced strategies. Our understanding of what makes new technology-based or knowledge-intensive firms succeed involves a variety of factors. Some of these refer directly to the entrepreneur as an individual embedded in a social context, others to the new firm as an actor itself, in a context characterised by a certain institutional setting. All these elements interact and influence each other at any given time and across time. We propose, therefore, to investigate them through a variety and combination of different methods (surveys and in-depth qualitative interviews), and in a longitudinal perspective.

Finally, entrepreneurial success is closely related to the experience of failure. Previous failures contribute to the development of an entrepreneur's human capital through the natural process of learning. In addition, the general acceptance of the risks connected with entrepreneurship, including the possibility of failure and bankruptcy, constitute an important aspect of the social environment influencing a country's economic activity. For these reasons, we have decided to explicitly include this issue in our investigation.

In light of the information gathered, and of the practical needs of knowledge expressed by the public and the private sector in Denmark, we have formulated a set of research hypotheses that will be tested during the empirical part of the research. These hypotheses are summarised in a causal and process model of entrepreneurship, which will be subjected to empirical verification.

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