ARE THEY HELPING?

An Examination of Business Incubators´ Impact on Tenant Firms

Tiago Ratinho

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suggests that the incubator is not always the preferred source for business support and, when it is, this support does not contribute to problem solving.

Chapter 5 The role of BIs in facilitating firm development

Based on the problem-solution framework, we look at 73 incubated companies analysing what determines support seeking and solving problems. Results suggest that although support is almost always sought, solution found depend on both incubator and own network support.

Chapter 6 Discussion and Conclusion

Research findings, theoretical contributions, managerial implications, further research.

Chapter 1

Introduction

1.1 Introduction

The creation of new companies is at the heart of economic growth. Since Schumpeter's notion of creative destruction (Schumpeter, 1942) the entrepreneur is deemed the responsible actor for bringing new ideas and companies to the markets. More recently, Audretsch (2007; Audretsch & Keilbach, 2007) devises entrepreneurship as the most important mechanism to transfer new knowledge to markets. Business incubators (BI) are instruments to facilitate this phenomenon, supporting entrepreneurs to leverage their business opportunities.

BIs have become a worldwide phenomenon. Typically funded by public money, BIs are promoted as tools to economic development. Since the first BI was established in Batavia, NY in 1959 (Adkins, 2002), the idea of aggregating young companies under one roof gained an extraordinary popularity, particularly during the 1980s. In 1980 there were 12 BIs in the USA; 25 years after, this figure is estimated to be about 1400 (Knopp, 2007). The incubation model spread to Europe and other parts of the world in its most varied forms: business innovation centre, incubateur and pepiniéres d'entreprises (French model), venture laboratories, etc. A large European study estimates in 2002 the existence of more than 900 BIs in the continent (EC, 2002). The United Kingdom Business Incubation association counts with more than 300 members (UKBI, 2011). In the whole world, as much as 350 were founded in the end of the 1990s (Hansen, Chesbrough, Nohria, & Sull, 2000). This popularity mirrors the importance governments, regional authorities and universities place in BIs to revitalize the economic fabric.

Practitioners often tout the benefits of BIs in supporting new ventures (Lewis, 2010; Tornatzky, Sherman, & Adkins, 2003). BIs have a potential effect in long term survival and subsequent growth of firms since they provide a comprehensive service portfolio to nascent companies. Delivered in an insulated environment, this support is customized according to each tenant firm's needs and designed to assist young companies in their initial stages of development. However, few studies confirm the value of BIs in securing better chances of survival for incubated firms.

In fact, Schwartz (2009) shows that incubated firms are more likely to fail in the three years after their graduation from an incubator. This suggests an offset effect, that is, BIs at best postpone the effects of each firm's liability of newness (Freeman, Carroll, & Hannan, 1983; Hannan & Freeman, 1984) and therefore only delay the firm's inevitable failure. Further, research has found little or no support for positive effects of BIs in university-industry interaction (Ratinho & Henriques, 2010; Rothaermel & Thursby, 2005a, 2005b) or innovation activity (Colombo & Delmastro, 2002).

Current research on BIs suggests that the value of BIs is not the same across the population of BIs. For instance, von Zedtwitz and Grimaldi (2006) show that service profiles are specific to the type of BI suggesting that some characteristics of BIs might determine their intervention on tenants firms. Allen (1988) suggest that BIs might provide different service portfolios according to their own development phase which means that the BI's age and experience has an impact on tenant firms' incubation outcomes. Further, Aerts and colleagues (2007) show that the selection practices impact subsequent tenant firms' survival rates. Taken together, the body of literature on incubation suggests that characteristics such as service portfolio and management practices such as selection procedure might have a determinant impact on the overall intervention of BIs on tenant firms.

The research compiled in this thesis investigates the internal operation of BIs. We assume that in order to have a positive effect in firm performance, job and wealth creation, or any other effects frequently listed by practitioners (e.g. NBIA, 2011; UKBI, 2011), each BI must deliver a comprehensive set of support services. We therefore chose to focus on the dynamics of this support delivery and specifically research the impact of BI on their respective tenants' development. Divided in stand-alone independent papers, the chapters that compose this book set out to understand what specific characteristics and practices promote BIs' effectiveness. Further, we will show the dynamics of business support by looking at how BIs actually provide support to their tenants.

This introductory chapter is organized as follows. We start by surveying literature discussing the definitions, functions and potential impacts of BIs. Next, we present the theoretical insights behind the BIs' dimensions which provide the basis for the remainder thesis chapters. In section 1.3 Problem Statement and Research Questions we present the overarching research question and craft the individual research questions that motivated each paper and chapter. Subsequently, we present two alternative operationalizations of BIs: i) as service provider and ii) as problem solving partners both drawing on insights of business incubation, management and entrepreneurship literature. Section 1.6 puts the thesis in the context of the research institute's current lines of research and, finally, section 1.7 describes the structure of the whole thesis.

1.2 What are Business Incubators?

There are several popular definitions of BIs from both professional and academic literature. It is interesting to note though that the emergence of a considerable population of BI around the world triggered self-defined incubation concepts and typologies. Further, throughout decades, public funding was made available to establish any model of BIs before any formal definition could be devised. There are two essential aspects in today's several definitions of BIs: the actual definition (what it is) and the often implicit impacts (effects) BIs have in firms, communities and science & technology.

1.2.1 Definitions

Despite the relative maturity of BIs both as practice and as a research field, a consensual definition for BIs is yet to be found (Table 1.1). In their comprehensive BI research overview, Hackett and Dilts (2004) offer that a "business incubator is a shared office space facility that seeks to provide its incubatees (…) with a strategic, value-adding intervention system of monitoring and business assistance" (p. 57). This echoes the commonalities found between other definitions put forth by

industry associations (NBIA, 2007; UKBI, 2007), large scale studies (EC, 2002; OECD, 1997) and academic work (Aernoudt, 2004; Sherman & Chappell, 1998) (Table 1.1). In sum, BIs are property based initiatives (Phan, Siegel, & Wright, 2005) and provide their tenants a mix of services comprising infrastructure, business support services and networking (Bergek & Norrman, 2008; Hansen, Chesbrough, Nohria, & Sull, 2000; Lalkaka & Bishop, 1996; Peters, Rice, & Sundararajan, 2004).

Table 1.1 – Definitions of Business Incubation

National Business Incubation Association (NBIA, 2007). Business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services. These services are usually developed or orchestrated by incubator management and offered both in the business incubator and through its network of contacts. A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding. These incubator graduates have the potential to create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies.
United Kingdom Business Incubation (UKBI, 2007). Business Incubation is a unique and highly flexible combination of business development processes, infrastructure and people, designed to nurture and grow new and small businesses by supporting them through the early stages of development and change.
European Commission (EC, 2002). A business incubator is an organization that accelerates and systematises the process of creating successful enterprises by providing them with a comprehensive and integrated range of support, including: Incubator space, business support services, and clustering and networking opportunities. By providing their clients with services on a 'one-stop-shop' basis and enabling overheads to be reduced by sharing costs, business incubators significantly improve the survival and growth prospects of new start-ups. A successful business incubator will generate a steady flow of new businesses with above average job and wealth creation potential. Differences in stakeholder objectives for incubators, admission and exit criteria, the knowledge intensity of projects, and the precise configuration of facilities and services, will distinguish one type of business incubator from another (p. 9).

Table 1.1 (cont.) – Definitions of Business Incubation

Organisation for Economic Co-operation and Development (OECD, 1997). Technology incubators are a specific type of business incubator: property-based ventures which provide a range of services to entrepreneurs and start-ups, including physical infrastructure (office space, laboratories), management support (business planning, training, marketing), technical support (researchers, data bases), access to financing (venture capital funds, business angel networks), legal assistance (licensing, intellectual property) and networking (with other incubators and government services) (p. 4).
Aernoudt (2004) An interactive development process where the aim is to encourage people to start their own business and to support start-up companies in the development of innovative products. (…) Besides accommodation, an incubator should offer services such as hands-on management, access to finance (mainly through links with seed capital funds or business angels), legal advice, operational know-how and access to new markets (p. 127).
Sherman and Chappell (1998). Business incubator is an economic development tool primarily designed to help create and new businesses in a community. Business incubators help emerging businesses by providing various support services, such as assistance in developing business and marketing plans, building management teams, obtaining capital, and access to a range of more specialized professional services. They also provide flexible space, shared equipment, and administrative services (p. 313).

These definitions also suggest some impacts of BIs. Sherman and Chappell (1998) conceive BIs as economic development tool while the EC study (2002) points that BIs support businesses with superior potential to create jobs and wealth. The NBIA (2007) goes further and devises BIs as tools to revitalize communities and strengthen national economies. The implicit assumption here is that supporting companies in their early years sheltered from the market aggressiveness will improve their chances of success and long term survival. In the specific case of Technology Incubators (OECD, 1997), the effects are more pronounced since BIs are "a significant link between the entrepreneur, especially one who is technology-oriented, and the commercialization of the product or service offered" (Smilor & Gill, 1986, p. 11).

1.2.2 Dimensions of Business Incubation

Business Incubation takes place along three main dimensions: infrastructure, business support and access to networks. These dimensions emerged throughout the evolution of incubation models but have implicit theoretical basis. Consider the case of infrastructure. BIs concentrate a certain number of companies housed under one single roof. This creates economies of scale (Panzar & Willig, 1977) and allows BIs to offer office space at reduced rates, often competitive when compared to other available real estate options. Further, infrastructure frequently includes other shared services such as meeting rooms, reception or car parking. Scope economies are in this case responsible for the cost reduction to tenants. Scale and scope economies surrounding infrastructure provision have several other advantages to tenants. First, tenants reduce their overhead costs by leasing office space bundled with the other shared resources. Second, services such as reception or meeting rooms would be difficult, if not impossible, for nascent firms to establish. Third, key-in-hand office space also eliminates the burden of planning, setting up and paying individual providers. Tenant companies do not have to put any effort or time in managing complementary services which allows them to concentrate on the venture's core activities. Finally, the economies of scale are, in many cases, strengthened by the subsidy generating capacity of BIs, which they partly transfer to their tenants.

Business support is related to accelerating the learning curve of nascent companies. New firms often lack the necessary management skills and experience to cope with sudden environmental shifts and rapidly changing environments (Zahra, Sapienza, & Davidsson, 2006). Through a process of learning-by-doing, new firms change their behavior and develop a set of routines. These routines include forms, rules, procedures, and strategies around which organizations are constructed and through which they operate (Levitt & March, 1988). People evaluate, make sense of the effects and organizational outcomes of past actions, and draw conclusions, which results in reshaping their cognitions (Bigley & Margarethe, 2002) and changing the behavior of the company. Developing routines and capabilities through experiential learning is a slow and gradual process (Dosi, Nelson, & Winter, 2000) and the lack

of such routines in firm's early stages contributes to a higher death propensity (Freeman, Carroll, & Hannan, 1983). Due to market imperfections, identifying and hiring relevant expertise and experience poses a serious difficult especially for nascent. In contrast with consultants who typically have little experience with start-up companies, tailored, hands-on business advice from seasoned incubation management is more productive and helpful. Furthermore, founders need active coaching in addition to training (Clarysse & Bruneel, 2007). Consequently, incubated firms do not have to go through a process of trial and error but can accelerate their learning curve. As a result, incubated new ventures will be able to make better and faster decisions, which results in better strategies and eventually superior performance (Eisenhardt, 1989).

Access to networks is the BIs' contribution to help new firms overcoming their inherent resource scarcity outside the incubator's context. BIs typically manage a network of professionals who can provide access to important resources which lay outside the incubator's scope. One example is venture capital. The lack of financial capital, often combined with inexperienced management teams hinders the development and subsequent growth of start-up companies. Research shows that these firms overcome their resource constraints through networking and thereby accelerate firm growth (Zhao & Aram, 1995). Further, Larson (1992) argues that entrepreneurial companies use networks to access resources that are beyond their financial capacity. BIs help firms in this respect, building networks with early stage investors such as business angel networks and venture capitalists, reducing thereby search costs for tenants companies and acting as brokers. New firms seldom have access to established networks for hiring specialized advice on very specific topics such as strategy consulting (Lee & Osteryoung, 2004) or patent attorneys (Rice, 2002). For instance, a venture trying to gain access to professional advice on a specific field of IP expertise might fail to do so because it does not have enough financial means to pay high consultancy fees.

There are two important side effects within BIs delivering support along these three dimensions with the potential to amplify the incubator's impact on tenant

companies. First, there are networking and agglomeration effects when companies are gathered in the same location. Practitioners frequently boast the usefulness and intensity of inter-tenant contacts (Sherman & Chappell, 1998). Indeed, partnering with other organizations also offers the opportunity to acquire new knowledge (Yli-Renko, Autio, & Sapienza, 2001) and develop new capabilities (Lane & Lubatkin, 1998). Building knowledge and capabilities through interorganizational relationships is faster than if the firm were to develop the knowledge and capabilities internally (Bruneel, Yli-Renko, & Clarysse, 2010). The acquisition of knowledge and real-time information is especially important in high velocity markets where knowledge is advancing rapidly (Eisenhardt, 1989). Networking with other companies also provides the firm with greater legitimacy in the market place (Aldrich & Fiol, 1994) which in turn has a positive impact on their chances for survival. Several studies already showed that new firms have little organizational legitimacy which limits their opportunities for resource acquisition and propensity to survive (Freeman, Carroll, & Hannan, 1983; Hannan & Freeman, 1984). It is therefore desirable that BIs' management actively promotes tenant interactions in ways that go beyond informal and merely supportive (Totterman & Sten, 2005).

Second, tenants can increase their legitimacy in the market by being located within a BI. New firms often deal with the lack of legitimacy when competing in the market with older established firms. Singh, Tucker and House (1986) showed that the acquisition of legitimacy through exchange relationships with other organizations increases firms' chances for survival. This can be the case of tenant firms housed in BIs. Further, McAdam and McAdam (2008) showed that tenants firms highly value the credibility associated with acceptance by the BI. This suggests that location within a BI display an external signal of quality to potential clients and markets.

1.2.3 Selection Criteria and Exit Policy

Business incubation also requires appropriate selection criteria and exit policies. These managerial features have been considered to be among one of the most important within BIs (Aerts, Matthyssens, & Vandenbempt, 2007; Lee & Osteryoung, 2004; Lumpkin & Ireland, 1988). For instance, if BIs select tenants from a variety of sectors, providing suitable infrastructure, business support services and access to networks is more difficult than if the population of tenants is more homogeneous, or sector specific. Further, sector-specific incubators achieve higher levels of economies of scale as their offerings are more specialized and tailored. Specialization increases the added value of the incubator for the tenant companies (Hansen, Chesbrough, Nohria, & Sull, 2000; Schwartz & Hornych, 2008).

Firm age plays an important role in building of capabilities and routines of organizations (Autio, Sapienza, & Almeida, 2000). In contrast to older organizations, young firms have to shape their organizational structure, processes, and routines. Older organizations have developed substantive capabilities (Zahra, Sapienza, & Davidsson, 2006) which hampers their ability to change their existing capability set and makes it more difficult to unlearn established routines. Further, the needs of organizations change as they grow and become more mature and established (Clarysse & Bruneel, 2007) as do the typical problems they face (Kazanjian, 1988). For example, the need for financing is associated with the different phases of the company life cycle and consists of different stages (Cieply, 2001). As a result, heterogeneity in terms of firms' age implies that the incubator has to implement different kinds of support mechanisms since firms' needs vary as they develop (Vohora, Wright, & Lockett, 2004). Since one of the key functions of BIs is to bridge the entrepreneurship gap (Aernoudt, 2004), BIs should therefore focus on supporting nascent businesses rather than accepting relocated companies.

BIs' exit policy should guarantee an adequate turnover of tenants thereby also contributing to a more specialized service portfolio. An important characteristic of BIs is therefore timely graduation of tenants (Rothaermel & Thursby, 2005a). BIs should enforce graduation within a 3-year time window; this is seen as a

conservative period for BI graduation (Rothaermel & Thursby, 2005a). BIs often incrementally increase rental rates to induce tenant graduation (Allen & McCluskey, 1990; Peters, Rice, & Sundararajan, 2004).

1.3 Problem Statement and Research Questions

BIs merits have long been suggested in several practitioner publications (Lewis, 2010; Tornatzky, Sherman, & Adkins, 2003). Indeed, some definitions devised by industry associations contain defining characteristics, impacts and management features altogether (see also 1.2.1). Yet researchers have found little or no evidence of BIs beneficial impact on several levels: job and wealth creation (Phan, Siegel, & Wright, 2005; Quintas, Wield, & Massey, 1992), university-industry interaction (Ratinho & Henriques, 2010; Rothaermel & Thursby, 2005a, 2005b), innovation activity (Colombo & Delmastro, 2002) or firm performance (Peña, 2004).

The lack of a universal systematic framework for analyzing BIs in all contexts (Hackett & Dilts, 2004; Phan, Siegel, & Wright, 2005) might be main reason behind these conflicting results. In an attempt to ameliorate this, Bergek and Norrman (2008) suggested recently that BIs should be assessed according to their characteristics. While this notion might solve this problem, it simultaneously allows organizations at the fringe of incubation models ("worst in class") to also receive positive evaluations and legitimize their practices. In any case, any models of BIs have been equally funded by governments, universities and local authorities and therefore became part of the BI landscape. Against this backdrop, we opt by not excluding any BIs based on definitions or functions but rather focus on analyzing their operations and impact on tenants. We position this research as an attempt to understand what characteristics and practices impact BIs' performance.

BIs performance can be observable in several levels. Among these, firm performance and economic development are by far the most common (Hackett & Dilts, 2004; Phan, Siegel, & Wright, 2005). On the firm level, it is often claimed that BIs provide (directly or indirectly) important resources to new firms who would not access them if located outside the incubator. On the economic level, BIs are

often said to contribute significantly to local and regional economic fabric by creating jobs and wealth. There are several, more or less, implicit assumptions in the previous sentences: (1) BIs are well equipped to help new firms, i.e., possess more knowledge and experience than entrepreneurs; (2) Selection procedures and tenant portfolio management ensure that the right companies are incubated; (3) Graduate companies have higher chances of survival and growth. Yet there are several different incubation models, management practices and research has shown an interdependence between typologies and the BI's intervention in tenant firms (Carayannis & von Zedtwitz, 2005; von Zedtwitz & Grimaldi, 2006). This is where we position our research. We set out to unveil which BI characteristics indeed contribute to tenant development. Development here is a broad term which is better specified in each piece of research. We present the following overarching research question is:

> **Which BIs characteristics determine the impact BIs have on tenants' development?**

This thesis is divided in papers specifically researching different BI characteristics that may have impact on incubated companies' development.

The evolution of BIs

The concept of BI evolved since the first BIs were established decades ago. Academic literature accompanied this evolution and over the years researchers developed numerous typologies (e.g. Aernoudt, 2004; Carayannis & von Zedtwitz, 2005), progressed in analyzing management practices (e.g. Aerts, Matthyssens, & Vandenbempt, 2007) as well as investigated the perceived value added of BIs (e.g. McAdam & McAdam, 2008). However, BI population is always described at a certain point in time and seldom is the question of evolution of BIs discussed. BIs started as office space providers (Adkins, 2002) and added other services to their value proposition later in time. It is not clear whether only newcomers established these improved service portfolios or older incumbent BI also upgraded their offer to tenants. Industry definitions tend to homogenize the BI population and therefore it is difficult to understand when and how these changes took place. Working with the

operational hypothesis that different generations of BIs exist based on their foundation date, we pose the following question:

> What are the differences between the value propositions across generations of BIs?

While the value propositions might differ or not on the supply side (BIs), we are also interested in assessing the extent to which tenant companies make use of the service portfolio – the demand side. The assumption here is that the more services tenants use the better and more complete the incubation process will be. Yet this is only true is the service portfolio is adequate to tenants' needs, i.e., BIs provide a mix of services that together are supporting tenants' development. Therefore, we added a second research question to this piece of research:

> Is the BI value proposition across generations arising from industry standards or developed to cater for tenants' needs?

Technology Business Incubators

Technology Business Incubators (TIs) are among the most common types of BIs (Knopp, 2007). The value added of TIs when compare to the remainder population of BIs is connected to the technology based nature of their incubated companies. Also, TIs tend to facilitate technology transfer and enhance technology commercialization (Colombo & Delmastro, 2002) and therefore are more likely to support technology based firms. It is believed that this kind of firms will have a greater contribution to economic growth and job creation since they facilitate and support innovative entrepreneurship (Audretsch, 2007). However, BI literature has not devoted much attention to investigate how TIs are different in terms of services provision to tenants firms. Also, the tenant portfolio characteristics are seldom part of the empirical base of most studies. Hence, we present the following question:

> What are the differences between TIs and Non Technology BIs in terms of service provision to tenants and tenants' characteristics?

Where tenants go for support

The third piece of research of this thesis focuses on the internal dynamics of business support within BIs. Research studies on the effects of business support typically describe an array of services and investigate the individual effects of each service in company performance (Bennett & Robson, 1999; Robson & Bennett, 2000). In this kind of design, little attention is given to the mechanism behind seeking support, providing support or the impact of different sources of support. We conceptualize business support as the most important feature of BIs and posit that BIs facilitate their tenants' development when helping those finding solutions to developmental problems. This draws directly on the knowledge based theory of the firm according to which solving problems is the fundamental mechanism firm use to develop their unique capabilities (Nickerson & Zenger, 2004). The research question is as follows:

> Where do BI tenants look for support and which sources are more effective?

The role of BIs in tenants' development

The fourth and final piece of research focuses in more detail in the dynamics of business support using a more refined analysis of the problem-solution framework. Drawing on similar theoretical insights as in the previous piece of research, we investigate the aggregated effects of experiencing problems, sources of support and solutions. The following research question guided this paper:

> Are BIs contributing to tenants' development by helping to solve their development problems?

Table 1.2 contains all the research questions as well as the empirical base used to research each question.

1.4 Operationalization of Business Incubation

We used two distinct operationalizations for business incubation based on two different conceptualizations. First we see BIs as service providers; this means that business incubation is measured in amount of services provided to tenants and that differences across BIs are analyzed as different levels of service provision. Second, we see BIs as problem co-solvers. This means that differences between BIs is measured as different levels of problem solving contributions.

1.4.1 BIs as service providers

Our first operationalization of BIs consists of a series of services provided along three dimensions described in section 1.2.2. The usage of services can be used to compare BIs in terms of their value added to tenants. Similarly, the service levels of provision per tenant are useful to compare the extent to which tenants make use of the BI value propositions. Chapter 2 and Chapter 3 use this conceptualization.

This operationalization consists of deriving services that can fulfill each dimension and investigating whether tenants make use of those. Business incubation takes place along three dimensions:

- **Infrastructure** as the basic function common to all kinds of BIs and the core of their value proposition (Allen & McCluskey, 1990). This consists of office space rented in favorable conditions to incubatees (Bergek & Norrman, 2008). Further, BIs often have small production facilities or mixed units available to their tenants (OECD, 1997). Shared resources such as reception, clerical services, meeting rooms, conference rooms or car parking (EC, 2002; McAdam & McAdam, 2008) complement the office space and are normally available in BIs. More specialized resources, such as laboratories and research equipment, can also be placed under infrastructure (Grimaldi & Grandi, 2005).
- **Business Support** services such as coaching and training are crucial elements of learning within BIs. Coaching is typically mentioned as an important service BIs provide to their tenants (Hansen et al., 2000; Mian, 1996). Coaching

generally means that tenant firms are assigned coaches either for an extra fee or free of charge. Coaching refers to one-to-one support initiatives geared to accelerate the tenants' learning process and the development of skills (Barrow, 2001; Knopp, 2007). Training is also often available within BIs (Aerts, Matthyssens, & Vandenbempt, 2007; Barrow, 2001). Trainings are less interactive and more general in content than coaching sessions. Training tools range from a training session on a specific topic to newsletters or access to common communication platforms.

- **Access to networks** of professional contacts is also part of the incubator concept (Hansen et al., 2000). Access to networks stimulates external collaborations and constitutes an important source of resources. Empirical evidence suggests that access to specialized networks is critical for the development of tenant companies (McAdam & McAdam, 2008). Access to financial resources is also often offered by BIs (Aerts, Matthyssens, & Vandenbempt, 2007). Connections with business angel networks and venture capital firms are important means of providing financial resources during early stages of tenants' development.

Each chapter contains the more specific set of services derived and empirically researched.

Table 1.2 – Structure of the thesis

Paper	Research Question	Data & Methods	Related articles
Chapter 2 An Assessment of Evolving Business Incubators' Value Proposition	What are the differences between the value propositions across generations of BIs? Is the BI value proposition across generations arising from industry standards or developed to cater for tenants 'needs?	7 BI = 2 Gen I + 2 Gen II + 3 Gen III 71 tenants = 25 Gen I + 19 Gen II + 27 Gen III Survey + Interviews + Secondary data	Bruneel, J., Ratinho, T., Clarysse, B., Groen, A. (2011) *The Evolution of Business Incubators: Comparing Demand and Supply of Business Incubation Services across different BI generations* Manuscript invited for resubmission with minor revisions to an international journal.
Chapter 3 Are Technology Business Incubators Different? An Examination of Service Portfolios And Selection Strategies?	What are the differences between TIs and Non Technology BIs in terms of service provision to tenants and tenants' characteristics?	12 BIs = 7 TIs and 5 NTBIs 101 tenants = 50 TIs and 51 NTBIs Survey + Interviews + Secondary data	Ratinho, T., Harms, R., Groen, A. (2010) *Towards a Distinction between Technology Incubators and Non-Technology Incubators: Can they contribute to Economic Growth?* In Fink, M., Hatak, I. (2010): Current Research on Entrepreneurship and SME Management, 7th Edition of InterRENT, European Council of Small Business and Entrepreneurship: Turku, ISBN 978-952-249-006-3
Chapter 4 Business Support Within Business Incubators	Where do BI tenants look for support and which sources are more effective?	12 BIs 101 tenants Partial correlation analysis	Ratinho, T., Harms, R., Groen, A. (2010) *Business Support within Business Incubators* Manuscript invited for resubmission with major revisions to an international journal.
Chapter 5 The role of BIs in facilitating firm development	Are BIs contributing to tenants' development by helping to solve their development problems?	12BIs 73 tenants OLS regression	Ratinho, T., Harms, R., Groen, A. (2010) *Are Business Incubators helping? The role of BIs in facilitating tenants' development*. Paper present at the Academy of Management Annual Meeting, Montréal, Québec, Canada, August 6-11, 2010

1.4.2 BIs as problem co-solvers

We build on insights from the knowledge based theory of the firm (Grant, 1996; Hsieh, Nickerson, & Zenger, 2007; Nickerson & Zenger, 2004) to conceptualize BIs as problem co-solvers. Nickerson and Zenger (2004) posit that solving problems within a firm is the basic mechanism of capabilities creation. RBV thinking and dynamic capabilities literature postulates that this is at the core of firm competitive advantage and long term survival (Barney, 1991; Teece, Pisano, & Shuen, 1997). As a result, we advance that BIs are important partners in building capabilities if they have an important role in solving tenants' developmental problems.

Chapter 4 and Chapter 5 are based on this conceptualization and use a set of problems identified in four main areas: strategy, economic, managerial and networks (Groen, Wakkee, & De Weerd-Nederhof, 2008; Parsons, 1964). **Strategic** decision is of crucial importance for any firm. Strategy involves the choice of how a firm will create value for its customers, satisfying their needs better than its competitors (Porter, 1996). **Economic** problem mostly derive from the imperfections in the capital markets that have long been identified as constraints to firm's financing (Hubbard, 1998; Stiglitz & Weiss, 1981). Since Penrose's seminal contribution to the theory of the firm (Penrose, 1959) that the lack of **management** skills is seen as a major constraint to growth. This is known as the Penrose effect (Thompson & Wright, 2005) and it has enjoyed empirical support since (Richardson, 1964; Shen, 1970). Finally, the value of **networks** for nascent and young firms has long been confirmed empirically (Birley, 1985; Hoang & Antoncic, 2003; Parker, 2008). The rationale behind the value of networks for firm development can be found in social capital (Portes, 1998); its impact on firm performance has also received broad empirical support (Davidsson & Honig, 2003; Yli-Renko, Autio, & Sapienza, 2001).

1.5 Empirical Setting

Business incubator initiatives are numerous and ubiquitous throughout the world. The latest available figures estimate over 1,400 incubators in North America and around 7,000 worldwide (Knopp, 2007). The UK alone currently has approximately 300 BIs (UKBI, 2011) housing circa 12,000 businesses. An EU-level study estimated that the 900 BIs in the continent generate some 30,000 new jobs per annum (EC, 2002). These figures demonstrate the importance given to BIs in recent decades.

The empirical setting for this thesis project was the Nensi project, on which the author worked collecting data for the initial two years of his doctoral research. Nensi is an acronym for North European Network of Service Incubators. This EU funded project ran from September 2003 till June 2008 and its main goal was to promote best practice exchange between all incubation partners. The final result can be seen in a guide developed by the involved parties called "The NENSI Guide to Service Incubation - A Guide to Setup and Manage a Service Incubator".

BI studies often draw on case studies and small samples of both incubators and their respective tenants. Project based represents thus a more effective way of collecting BI data on a wider scale and it has be utilized by several other researchers (Carayannis & von Zedtwitz, 2005; Grimaldi & Grandi, 2005).

1.5.1 The NENSI Project

The project had a total of 12 partners distributed across six European countries (Belgium, France, Germany, Ireland, the Netherlands and the United Kingdom). Of those, only five were individual incubators; the remainder were regional associations grouping and managing incubators and a university research group. A short description of each partner follows:

- The lead partner was ROC van Twente, a regional school for vocational and adult education in the region of Twente. ROC van Twente owns and manages the Campus Business Centre (one of the incubators in the network).

- Nikos, the Dutch Institute for Knowledge Intensive Entrepreneurship, University of Twente. Research group where the authors carried his research.
- Bedrijfstechnologisch Centrum Twente (BTC) located in Enschede, the Netherlands, is one of the oldest BIs in Europe. Established in 1982 by the University of Twente, offers flexible space to all kinds of companies.
- Campus Business Centre (CBC) located in Hengelo, the Netherlands, is owned and managed by the ROC van Twente. Established in 2005 caters for the needs of all kinds of companies focusing on incubating business ideas stemming from a vocational school.
- Coventry University Enterprises (CUE) located in Coventry, United Kingdom, is a subsidiary of Coventry University established to support the corporate aims and seek to maximize the commercial potential of the University's skills, expertise and resources. Through CUE, we included in our sample the Coventry University Technology Park (CUTP) and Eliot Park Innovation Centre (EPIC), both operated by CUE.
- Dublin City Enterprise Board (DCEB) is located in Ireland's capital city. DCEB is a state funded agency that assists nascent entrepreneurs and micro businesses in Dublin city with business support. Some of this business support is provided to the city's incubators so that it can then be administered to their respective tenants. Through DCEB, we included in our sample three BIs: the Guinness Enterprise Centre; iCELT; and the Terenure Enterprise Board.
- East Midlands Incubator Network (EMIN) is located in Leicester, United Kingdom, and concentrates together all University BIs in the East Midlands. EMIN provides a complete package of valuable business and technical assistance to start-up companies in the region. Through EMIN, we included in our sample the De Montfort University's Innovation Centre and the Sparkhouse Studios.
- Emergence is the BI established by the city of Caen, in France. Established in 1995, offers office space to young companies in any sector of activity.

- Normandie Incubation (NI) is also located in the city of Caen but aims at incubating business ideas and supporting them is establishing a company. It was established in 1999 and offers mainly targeted services to its tenants.
- ROC ASA is a regional educational centre located in the city of Amsterdam, the Netherlands. It has on its premises a business centre providing office space and business support to its tenants. Further, it participated in the project sharing the experience of its entrepreneurship course on a high school and vocational school level.
- Technologieförderung Münster was established by the city of Münster, Germany, to foster innovation and technolog transfer in the city. Also, it sets out to train and support the growth of technology-oriented firms. We included in our sample the companies based at their premises.
- UNIZO Zuid-West Vlaanderen is located in Kortrijk, Belgium. It is the biggest association of independent entrepreneurs in Belgium. Associates enjoy several business support services. Through them, we included in our sample businesses located in Kortrijk more active in requesting business support from UNIZO.

Together with a fellow researcher colleague, the author's role representing Nikos in Nensi was to develop a monitoring tool to assess incubation impact on tenants longitudinally. The initial idea was to collect data every six months during the project truly monitoring the performance of incubated firm throughout time.

Although self-selected, we believe the BIs to be representative of their countries and the population of BIs given their different shareholders, focus and delivery of services. Each chapter will contain more detailed descriptions of each of the BIs used for each specific piece of research.

1.6 Embeddedness in IGS research (SRO Innovation and Entrepreneurship)

The Institute for Innovation and Governance Studies is one of the priority research institutes of the University of Twente and performs multi-disciplinary research and postgraduate research training in the field of the governance and management of technological and social innovation. "Management of Innovation and Entrepreneurship" Strategic Research Orientation (SRO) is one of the four research streams of the institute and the one in which this dissertation is linked to.

The Management of Innovation and Entrepreneurship SRO joins operations management, organization theory, human resource management, strategy, marketing, international management and entrepreneurship researchers from Nikos (Dutch Institute for Knowledge Intensive entrepreneurship) and OOHR (Operations, Organizations and Human Resources) departments. Three cornerstones of this research are:

- The interactions between characteristics of Technology, Innovation, Human Resources, and Entrepreneurship within and between Organizations related to innovation performance in manufacture and service firms;
- Multi-level and multidimensional analysis of network actors in innovation and entrepreneurship processes;
- Qualitative and quantitative methodologies in process-oriented research in line with the "engaged scholarship approach" (Van De Ven, 2007; Van De Ven & Johnson, 2006). This approach allows this SRO to describe, explain, and predict the performance of innovation and entrepreneurship constellations ensuring the practical relevance of hits area of research.

Combining these insights, the research tradition at Nikos and OOHR is intertwined with practice as the multiple projects in collaboration with industry show. Among these, business development programs have been particularly important in Nikos' line of research. This dissertation is based on one of those projects setting out to

research and describe the current situation within BIs in terms of support as well as to provide further considerations on how to improve Nikos' continuous business development efforts.

The knowledge stemming from this research was already used in Nikos' activities. Several master students' theses have been written using fresh insights on the business incubation process as well as conference paper contributions (Grigorian, Ratinho, & Harms, 2010; Ogenio, Ratinho, & Harms, 2010). Further, new projects using incubated firms as the empirical setting have also started (Englis, Englis, Ratinho, & Groen, 2011; Englis, Ratinho, Englis, & Harms, 2010; Kraaijenbrink & Ratinho, 2010) showing that the incubation setting is adequate to research further topics in organization behavior, strategic management and marketing.

1.7 Who Should Read this Book

Our target audience is primarily the community of entrepreneurship academics interested in improving our understanding about the phenomenon of business incubation. BIs often claim to have an imprinting effect on tenant firms and, as a result, contribute to higher chances of survival and growth. This makes the BI empirical setting optimal to research how early stage organizational capabilities emerge. This book contains an analysis of when, what and why nascent firms look for external support when placed in a supportive environment. Further, BIs have always defined themselves as policy-driven instruments to facilitate the creation of new companies and are, therefore, interesting study objects from the perspective of entrepreneurship policy. While BIs have been popular especially since the 1980s, academic research has not been able so far to establish their value in contributing to firm development or regional job and wealth creation. Our contribution sheds light on how can BIs best contribute to firm development and, indirectly, to the goal of creating jobs and spurring economic growth.

We believe that we also possess some important recommendations to practitioners. For BI managers, we show what happens within incubators in terms of levels of support and how that is connected to tenants profile and BI mission. BI managers

have the ability of shape BI's tenant portfolio as well as the bundle of services available to support companies. An improved understanding of how these parameters interact can aid current and future BI managers to shape their BI environment.

Finally, our work is relevant to policy makers. The promotion of entrepreneurship has become a cornerstone of economic policy in the recent decades. Our results show how BIs can improve their effectiveness and, as a result, increase the chances of contributing to job and wealth creation. Policy makers are often times responsible for the design, establishment and management of BI. Improving our understanding of the internal mechanisms of incubating business is of utmost importance to the healthy functioning of both established and future BIs.

1.8 Thesis Structure

This thesis is based on a collection of four research papers (Chapters 2 to 5) (Table 1.2). Additionally, we included an introductory chapter, managerial implications and conclusions. This first two research papers (Chapters 2 and 3) investigate the relationship between BIs' characteristics and their internal operation, namely their service provision levels. Today's BIs are mainly service providers setting out to help companies to establish themselves and thrive successfully. It follows that an adequate business support portfolio that caters to tenants' needs must be in place to ensure incubated companies have some advantage in being located inside a BI. Therefore, what determines higher service provision levels is a fundamental question for both BI managers and prospective tenants. The following two research pieces (Chapters 4 and 5), on the other hand, discuss the internal mechanisms of business support. We used insights from the RBV of the firm and we build on the notion of problem solving as the basic mechanism to achieve and maintain competitive advantage. This work investigates the problem solving patterns of incubated firms specifically analyzing what the impact of BIs is in helping their tenants to develop. This remainder of this section provides an overview all research-based chapters as well as a summary of results and their relationship between them.

Chapter 2 represents an effort in relating BIs generations with their business support portfolio. The population of BIs belongs to different generations as a result of their foundation date and, more importantly, the evolution of incubation paradigms. This chapter is based on a paper in which we argue that these business support portfolio variance might not be visible anymore when looking exclusively at the BIs but only when tenants are enquired. Our basic research proposition in this study is to understand whether there are any generational effects in the business support portfolio of BIs and, if so, what the effects on tenants provision portfolios. Data was collected within business incubators and among their respective tenants. We purposefully selected seven representative BIs located across six European countries. Results show that although the BI offer approximately the same business support services tenants make a considerable different use of those. Third generation BIs tenants tend to use more services therefore enjoy a more complete incubation process. We suggest that this is a consequence of screening for different types of companies as well as not applying clear exit policies.

Chapter 3, in its turn, looks at the impact of the mission of BI and how that is reflected in its business support services provision level. Although together technology based BIs and mixed use BIs account for almost the total population of BIs, little is known about their specific characteristics. Also, research has not been able to differentiate these types of BIs in terms of their management practices. Similarly to the previous chapter, we used data collected in both the BIs and their tenants. Results show that technology based BI provide more tenants with a complete service portfolio than their non-technology counterparts. Further, the mission to incubate technology based companies is related to stricter selection criteria, exit policies and attracting more specialized entrepreneurs.

The internal mechanisms of business support provision are the main theme dealt with in Chapter 4. In this study we conceptualize business support as help given by the BI to tenants aiming at solving developmental problems. Building on insights of social system theory, we hypothesize that business support emerging from several sources has a positive effect in solving problems. Our data set for this piece of

research includes 95 incubated companies located in 12 BIs. Results show that tenants experience fewer problems than expected problems and, when they do, business support is not necessarily sought. Furthermore, our analysis suggests that business support is not preferentially sought within the incubator environment. When this happens, support provided by the BI does not contribute to problem solving. Chapter 5 advances Chapter 4 investigating BIs' internal support mechanisms together with other firm characteristics. Using a subset of 63 incubated companies, we show that tenants seek support unequivocally after experiencing developmental problems. Yet solving those problems is a function of BI support and other external sources. Age and human capital of tenant firms have a negative impact in the total number of the problems solved, suggesting BIs' deficiencies in helping more experienced and older tenants.

Chapter 6 takes together all our current results to draw managerial implications. Finally, Chapter 7 discusses the results and answers the research questions posed in this chapter. Limitations and futures avenues for BI research are also presented.

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Chapter 2

An Assessment of Evolving Business Incubators' Value Proposition

This chapter is based on:

Bruneel, J., Ratinho, T., Clarysse, B., Groen, A. (2011) *The Evolution of Business Incubators: Comparing Demand and Supply of Business Incubation Services across different BI generations* Manuscript invited for resubmission with minor revisions to an international journal.

Earlier versions of this paper were presented at the Babson College Entrepreneurship Research Conference 2010 and published in Langan Fox, Janice (ed.) 2010 Regional Frontiers of Entrepreneurship Research 2010, The Australian Graduate School of Entrepreneurship, Swinburne University of Technology, Melbourne, Australia.

Abstract

Business incubators are established around the world to spur the creation of new companies. While it is accepted that incubation models evolved, little is known about the extent to which existing incubators adjusted their value proposition to recent incubation paradigms or remain operating as they were founded. We present data on seven European BIs and their respective tenants. Our findings show that while BIs offer similar support services regardless of their generation, tenants in the older generations make less use of the incubator's service portfolio. We suggest this is a consequence of non strict selection criteria and the lack of a clearly defined exit policy. These results imply that older incubators need to update their service portfolio while simultaneously imposing stricter selection criteria and implementing exit criteria. Finally, we discuss the implication for incubators' managers, prospective tenants and policy makers.

Keywords: Business Incubation, Business Support, Entrepreneurship

2.1 Introduction

Business Incubators (BIs) are popular tools to accelerate the creation of successful entrepreneurial companies. There are about 900 BIs in the European Union (EC, 2002) and over 1,400 in the US (Knopp, 2007), numbers showing a steep increase in the previous decades. Since BIs are often publicly funded (Lewis, 2001; OECD, 1999, 2010), this translates in a growing interest of policy makers in placing BIs as a central tool in economic rejuvenation programs. BIs typically support new ventures aiming at generating self-sustaining thriving companies. This support is delivered along several dimensions such as space, shared resources, business support, and access to networks (e.g. Barrow, 2001; e.g. Smilor & Gill, 1986).

Practitioner publications often claim the benefits of BIs (Lewis, 2010; NBIA, 2011). There is, however, little systematic evidence of BI's efficacy in promoting job and wealth creation (Massey, Quintas, & Wield, 1992; Phan, Siegel, & Wright, 2005). Further, research found little or no evidence of BIs contribution to university-industry interaction (Rothaermel & Thursby, 2005a, 2005b), innovation activity (Colombo & Delmastro, 2002), or firm performance (Peña, 2004). Hackett and Dilts (2004) offer that this is a consequence of the frequent lack of an adequate theoretical lens to analyze consistently BIs' activities. We advance the proposition that the evolution of the BIs' value proposition over the past decades is crucial to understand and assess their impact on incubated firms.

BI became widespread in the 1980s mainly as office space providers, agglomerating companies under the same roof (Adkins, 2002; Lalkaka & Bishop, 1996). This value proposition quickly evolved during that decade when lack of business expertise proved to be an important barrier to new firms' success. Throughout the 1990s, BIs expanded the value proposition beyond infrastructure by providing in-house business support services geared towards accelerating the new firms' learning process (Lalkaka & Bishop, 1996). Recently, the value of the networks for new firms triggered a new type of BIs to include preferred access to networks in their value proposition (Hansen, Chesbrough, Nohria, & Sull, 2000). Yet extant literature

largely overlooks how this evolution of BI's value proposition affected service portfolios or management practices. For instance, large scale and industry studies (EC, 2002; Knopp, 2007; OECD, 1997, 1999; Tornatzky, Sherman, & Adkins, 2003) show differences in BIs value proposition but fail to advance any explanation. Hence, our first research question: Are there differences between the value propositions across generations of BIs? Arguably, differences between the value propositions of BIs would only be observable if assessed by the tenants themselves. Therefore, our second research question seeks to understand whether the value proposition of each generation of BIs is catered to the needs of their tenants.

2.2 Business Incubators' Value Proposition

Practitioners and academics have put forth definitions of business incubators (Bergek & Norrman, 2008; EC, 2002; Hackett & Dilts, 2004; Hansen, Chesbrough, Nohria, & Sull, 2000; Merrifield, 1987; NBIA, 2011; OECD, 1997; Peters, Rice, & Sundararajan, 2004; Phan, Siegel, & Wright, 2005; UKBI, 2011). Among these, two key common features emerge. First, BIs focus on the support of nascent companies promoting their growth and maximizing their chances of survival. The main goal is that supported companies receive the help necessary to survive and thus contribute to the creation of jobs and wealth. Second, the support services are adjusted to firms' needs and consist of infrastructure, business support services and access to networks.

The concept of business incubation evolved since the establishment of the first BIs. Academic research has accompanied this evolution although most published studies are descriptive and use no consistent theoretical lens (Hackett & Dilts, 2004). We advance the working hypothesis of generation of BIs and show that each generation of BIs added one dimension to their value proposition. Further, we link each dimension to a different theoretical insight: economies of scale, learning, and networking theories.

2.2.1 Evolution of business incubation: extending the value proposition

Infrastructure: economies of scale

The first BIs were established in the USA in the 1950s (Adkins, 2002). The concept became widespread in the 1980s and spread to the rest of the world in its most varied forms (business centers, innovation centers, etc) (EC, 2002). These first generation BIs offered affordable office space and shared resources (Barrow, 2001; Lalkaka & Bishop, 1996). Infrastructure is the basic function common to all kinds of BIs and the core of their value proposition (Allen & McCluskey, 1990); it consists of office space rented in favorable conditions to incubatees (Bergek & Norrman, 2008). Further, BIs often have small production facilities or mixed units available to their tenants (OECD, 1997). Provision of space is critical to business incubation and has been elected by tenants as the most beneficial feature of incubators (Chan & Lau, 2005). Shared resources such as reception, clerical services, meeting rooms, conference rooms or car parking (EC, 2002; McAdam & McAdam, 2008) complement the office space and are normally available in BIs. More specialized resources, such as laboratories and research equipment, can also be placed under infrastructure (Grimaldi & Grandi, 2005).

Tenants profit from existing economies of scale within the BIs when renting office space together with shared resources. Offering company space together with shared resources has several advantages to tenants. First, the existence of scale economies causes a reduction of the tenants' overhead costs. Each tenant enjoys office space together with a bundle of shared resources including energy, water, telecommunications and cleaning, among others. Second, BIs provide new firms with services they probably would not have access to during such early stages of development such as meeting rooms, reception services or private parking space. Third, this also eliminates the burden of planning, setting up and paying individual providers. Tenant companies do not have to put effort and time in managing complementary services which allows them to concentrate on their core activities.

Finally, the economies of scale are, in many cases, strengthened by the subsidy generating capacity of BIs, which they partly transfer to their tenants.

Business support: accelerating the learning curve

Governments in Europe and in the US were confronted during the 1980s with accelerating unemployment in traditional sectors. It became clear that innovation and technology would become the cornerstones of economic growth and that new strategies were necessary to revitalize economies. BIs became a popular tool to promote the creation of new technology-intensive companies (Lewis, 2001). Such companies need more specific services than just affordable office space and shared resources. Nascent technology-intensive companies typically lack business experience and marketing skills and therefore may have limited chances for survival. Newly established BIs reacted by including knowledge based services in their value proposition. As a result, this second generation of BIs already represented much more than just a physical arrangement for start-up companies (Smilor & Gill, 1986).

New firms often lack the necessary management skills and experience to cope with sudden environmental shifts and rapidly changing environments. Through a process of learning-by-doing, new firms change their behavior and develop a set of routines. These routines include forms, rules, procedures, and strategies around which organizations are constructed and through which they operate (Levitt & March, 1988). People evaluate, make sense of the effects and organizational outcomes of past actions, and draw conclusions, which result in reshaping their cognitions (Bigley & Margarethe, 2002) and changing behavior of the company. Developing routines and capabilities through experiential learning is a slow and gradual process (e.g. Dosi, Nelson, & Winter, 2000). The lack of such routines in firm's early stages contributes to a higher death propensity (Freeman, Carroll, & Hannan, 1983). Due to market imperfections, identifying and hiring relevant expertise and experience is very difficult. In contrast to consultants who typically have little experience with start-up companies, tailored, hands-on business advice from seasoned incubation management is more productive and helpful. Furthermore, founders need active

coaching in addition to training (Clarysse & Bruneel, 2007; Kirwan, van der Sijde, & Groen, 2006). Consequently, incubated firms do not have to go through a process of trial and error but can accelerate the learning curve. As a result, these new ventures will be able to make better and faster decisions, which results in better strategies and eventually higher firm performance (Eisenhardt, 1989b). Furthermore, training sessions on relevant topics can contribute to increase the ventures' knowledge base and therefore have a positive impact on their development and performance (Colombo & Grilli, 2005; Davidsson & Honig, 2003).

Business support services such as coaching and training are crucial elements of learning within BIs. Coaching is typically mentioned as a important service BIs provide to their tenants (Hansen, Chesbrough, Nohria, & Sull, 2000; Mian, 1996). Coaching generally means that tenant firms are assigned coaches or mentors either for a fee or free of charge. Coaching refers to one-to-one support initiatives geared to accelerate the tenants' learning process and the development of skills (e.g. Barrow, 2001; Knopp, 2007). The coaching typically covers both scientific and managerial areas of expertise (Clarysse & Bruneel, 2007). This kind of service is critical to tenants' timely graduation (Peters, Rice, & Sundararajan, 2004), proving its impact on firm development (cf. Robson & Bennett, 2000). Training is also often available within BIs (Aerts, Matthyssens, & Vandenbempt, 2007; Barrow, 2001) and has been found to have a positive influence on tenants' performance (Peña, 2004).

Networks: facilitating access to external resources, knowledge and legitimacy

The third generation of BIs emerged during the 1990s with an emphasis on providing services through external networks (EC, 2002; Lalkaka & Bishop, 1996). The network exploitation by the BI provide tenants with preferential access to potential customers, suppliers, technology partners and investors (Hansen, Chesbrough, Nohria, & Sull, 2000). Institutionalized networks established and managed by incubators means that networking is no longer dependent on the personal networks or contacts of individuals (Bøllingtoft & Ulhøi, 2005). Hansen

and colleagues posits that networking is the most important factor in successful incubator programs (2000) and empirical evidence suggests that access to networks is critical for the development of BIs' tenant companies (McAdam & McAdam, 2008). In essence, facilitating access to external networks by BIs eases the acquisition of resources and specialized expertise, provides learning opportunities and allows the new firms to build up legitimacy faster.

Access to networks is the BIs' contribution to help new firms to overcome their inherent resource scarcity. The lack of financial capital, experienced management teams, and capabilities hinders the development and subsequent growth of start-up companies. Research shows that these firms overcome their resource constraints through networking and thereby accelerate firm growth (Zhao & Aram, 1995). Larson (1992) argues that entrepreneurial companies use networks to access resources that are beyond their financial capacity. BIs build networks with early stage investors such as business angel networks and venture capitalists, which reduce the search costs for tenants companies. Next to providing the necessary funds, venture capital investors also play an important role in the professionalization of the venture (Gorman & Sahlman, 1989). Venture capitalists typically have a control function, supervising the firm's activities to ensure their own investment as well as a support function to support the growth of their portfolio companies. As a result, venture capitalists contribute to the firm's development by covering their financial needs as well as professionalizing organizational structure and managerial processes (Hellmann & Puri, 2002). Similarly, new firms seldom have access to established networks for hiring specialized advice on very specific topics such as strategy consulting (Lee & Osteryoung, 2004) or patent attorneys (Rice, 2002). For instance, a venture trying to gain access to professional advice on a specific field of IP expertise might fail to do so because it does not have enough financial means to pay high consultancy fees.

Partnering with other organizations also offers the opportunity to acquire new knowledge (Yli-Renko, Autio, & Sapienza, 2001) and develop new capabilities (Lane & Lubatkin, 1998). Building knowledge and capabilities through

interorganizational relationships is faster than if the firm were to develop the knowledge and capabilities internally (Bruneel, Yli-Renko, & Clarysse, 2010). The acquisition of knowledge and real-time information is especially important in high velocity markets where knowledge is advancing rapidly (Eisenhardt, 1989b). Networking with other companies also provides the firm with greater legitimacy in the market place (Aldrich & Fiol, 1994) which in turn has a positive impact on their chances for survival. Several studies already showed that new firms have little organizational legitimacy which limits their opportunities for resource acquisition and propensity to survive (e.g. Freeman, Carroll, & Hannan, 1983; Hannan & Freeman, 1984). Singh, Tucker and House (1986) showed that the acquisition of legitimacy through exchange relationships with other organizations increases firms' chances for survival. Table 2.1 summarizes the evolution of BIs and the theoretical rationale of each dimension.

2.2.2 Selection criteria and exit policy of business incubators

Together with the service portfolio, business incubation also requires appropriate selection criteria and exit policies. These managerial features have been considered to be among one of the most important management features of BIs (Aerts, Matthyssens, & Vandenbempt, 2007; Lee & Osteryoung, 2004; Lumpkin & Ireland, 1988). For instance, if BIs select tenants from a variety of sectors, providing adequate infrastructure, business support services and access to networks is more difficult than if the population of tenants is more homogeneous, or sector specific. Further, sector-specific incubators achieve higher levels of economies of scale as their offerings are more specialized and tailored. Specialization increases the added value of the incubator for the tenant companies (Hansen, Chesbrough, Nohria, & Sull, 2000; Schwartz & Hornych, 2008).

Table 2.1 – Summary of the evolution of business incubation's value proposition

	First generation	Second generation	Third generation
Offering	Office space and shared resources	Coaching and training support	Access to technological, professional, and financial networks
Theoretical rationale	Economies of scale	Accelerating the learning curve	Access to external resources

Firm age plays an important role in building of capabilities and routines of organizations (Autio, Sapienza, & Almeida, 2000). In contrast to older organizations, young firms have to shape their organizational structure, processes, and routines. Older organizations have developed substantive capabilities (Zahra, Sapienza, & Davidsson, 2006) which hampers their ability to change their existing capability set and makes it more difficult to unlearn established routines. Further, the needs of organizations change as they grow and become more mature and established (Clarysse & Bruneel, 2007) as do the typical problems they face (Kazanjian, 1988). For example, the need for financing is associated with the different phases of the company life cycle and consists of different stages (Cieply, 2001). As a result, heterogeneity in terms of firms' age implies that the incubator has to implement different kinds of support mechanisms since firms' needs vary as they develop (Vohora, Wright, & Lockett, 2004). Since one of the key functions of BIs is to bridge the entrepreneurship gap (Aernoudt, 2004), BIs should therefore focus on supporting nascent businesses rather than accepting relocated companies.

BIs' exit policy should guarantee an adequate turnover of tenants thereby also contributing to a more specialized service portfolio. An important characteristic of BIs is therefore timely graduation of tenants (Rothaermel & Thursby, 2005a). BIs should enforce graduation within a 3-year time window; this is seen as a conservative period for BI graduation (Rothaermel & Thursby, 2005a). BIs often incrementally increase rental rates to induce tenant graduation (Allen & McCluskey, 1990; Peters, Rice, & Sundararajan, 2004).

2.3 Research design

2.3.1 Research context

We utilize the multiple case study method to research the differences among generations of BIs. As such, we selected a small number of representative cases, following the recommendations of Eisenhardt and colleagues (1989a; 2007). First, we wanted to have a representation of three generations of BIs. Hence, we selected BIs established in different time periods (1980s for the first generation, early 1990s for the second generation, and late 1990s – early 2000s for the third generation). Second, we selected BIs with a mission of supporting new business creation. Incubators may position themselves to support new business ideas and develop them to become new ventures (the idea hatchers) while others may help already established companies to grow. Most researchers, however, conceptualize incubators as those that support ventures in the earliest stages of development (Bergek & Norrman, 2008).

We study the Bedrijfs Technologisch Centrum Twente (Nl) and Technologieförderung Münster (De) as examples of first generation of BIs. The Bedrijfs Technologisch Centrum Twente (BTC) started to operate in 1982. Located next to the University of Twente campus in Enschede, the incubator offers about 4700 m2 of office space, workshops and laboratories to tenants. The centre is profit oriented and its shareholders are the University of Twente, Saxion University of Applied Sciences, ABN AMRO and Ten Hag, a regional real estate company. Its current mission is to house innovative high-tech companies preferably spinning out from the University of Twente. In recent years, BTC was involved in several international projects sharing incubation best practices. Technologieförderung Münster (TFM) founded its first building in 1985. Owned mainly by the City of Münster (88%), it provides 6900 m2 of office space, workshops, laboratories and mixed use units to tenants. TFM is a non-profit regional development agency, promoting entrepreneurship courses in the region as well as managing regional networks in specific knowledge areas (e.g. Geonetzwerk Münsterland), generally

together with local universities and research centers. We only consider in this study companies located within the Technology Center of the TFM.

The cases for the second generation BIs include Erasmus European Business & Innovation Center (Be) and Jülich Technologiezentrum (De). The Erasmus European Business & Innovation Center (EEBIC) was created as a for-profit incubation centre in 1992 on the initiative of the Brussels – Capital Region and the Université Libre de Bruxelles. The aim of the 6000 m2 centre is to stimulate and support high-tech entrepreneurs in the region. The incubation centre has a strong link with the Université Libre de Bruxelles and plays an important role in the valorization of the university's research. Next to an annual subsidy, EEBIC generates income from the coaching services it provides to the tenants and the rent of office space. Jülich Technologiezentrum (JTZ) is part of a large network of BIs in Germany (360 in total) and located in the Cologne-region. The centre was created to stimulate research commercialization of the nearby Research Centre through the creation of spin-off activity. With this purpose, the regional government and the city of Jülich made an investment of 15 million Euros. The centre did not receive further subsidies after founding nor does it take shares in the tenant companies. Therefore, office space rental is JTZ's sole source of revenues.

Table 2.2 – General characteristics of the researched business incubators.

	First generation		Second generation		Third generation		
	BTC	TF Münster	EEBIC	Jülich TZ	Chalmers Innovation	Normandie Incubation	Innovation Centre @DMU
Foundation	1982	1985	1992	1992	1998	2000	2001
Region	Overijssel (Nl)	Münsterland (Ge)	Brussels-Capital Region (Be)	Cologne area (Ge)	West Sweden (Se)	Lower Normandy (Fr)	East Midlands (UK)
Business model	Profit	Not-for-profit	Profit	Not-for-profit	Profit	Not-for-profit	Not-for-profit
Office space (m^2)	4700	6900	6000	8000	5000	300	650
Number of tenants	68	42	23	36	18	18	18

We selected Chalmers Innovation (Se), Normandie Incubation (Fr), and the Innovation Centre (UK) as cases to represent the third generation incubators. Chalmers Innovation (CI) has been widely recognized as a best practice and subsequently discussed in the literature (e.g. Jacob, Lundqvist, & Hellsmark, 2003). The creation of Chalmers Innovation resulted from a donation of five million Euros by "The Sten A. Olsson Foundation for Research and Culture" in 1997. The donation enabled the development of a new 5000 m2 centre for "innovation related activities" nearby Chalmers University of Technology - a Chalmers Innovation – in 1999. Given the strong link with Chalmers University of Technology, the centre focuses on the incubation of technology-oriented start-ups. The business model of CI is based on three components: office space rental, subsidies and revenues from participation in the tenants. Normandie Incubation (NI) was established in 2000 as a direct result of the so called French Law of Innovation and Research. This sanction aimed to improve the valorization of public research and made available a grand total of 30 million Euros to set up BIs in France. NI brought together the Université de Caen Basse-Normandie, the Ecole Nationale Supérieure d'Ingénieurs de Caen and the Grand Accélérateur National d'ions Lourds as founders. Besides those three high education institutions, there 14 more associate members (mainly regional public and private research institutes). NI is a pre-incubator: it selects projects based on their innovativeness and it allocates a maximum of 50,000 Euros for 24 months to help them become companies. NI is a small non profit incubator (300 m2 for tenants) and gets its revenue mainly from the national and regional public institutions, its members and European projects. Also, the tenants are required to pay rent with a two year lag and no interest. The Innovation Centre (IC) at DeMontfort University was founded in 2001 within the Leicester City Centre campus. The IC has 18 office units including two dedicated workshops for small production manufacturing and prototyping. The centre operates a nonprofit; revenues come mostly from the public sector (75%) and tenants rent (25%). Table 2.2 provides an overview of the main characteristics of the seven BIs.

2.3.2 Data collection and methods

We employed a two-step research design that spans a qualitative study of the selected BIs and a quantitative study of their tenants. First, we performed in–depth case studies of the supply side of incubation (BIs). The qualitative research methodology is preferred given the need for a deep understanding and local contextualization of the topic (Miles & Huberman, 1994). As suggested by Yin (2009), we did a comparative study to benchmark the different generation of BIs. The data for the first step was collected during semi-structured face-to-face interviews with key staff of BIs. The number of interviews with key staff ranged from three to six per BI. The goal of these interviews was twofold: a) to gain insight about the BI's background, enquiring on characteristics such as shareholders, strategy, and brief history; b) to map the value proposition offered to tenants in terms of infrastructure, business support services, and access to networks.

In the second step of data collection, we interviewed a member of the top management of tenant companies – typically one of the founders or the CEO – using a standardize questionnaire. Together with the general information about each company (such as age, size and sector of activity), a key issue of these interviews was to gain insight about the extent to which tenants enjoy the value proposition of their respective the BI by focusing on the usage of each available service using yes/no questions. The data collection was carried out from early 2005 to late 2006. In total, we interviewed 71 tenants with the response rate per BI ranging from 40% at EEBIC to 75% at NI. Searching for data triangulation (Yin, 2009), we duly collected additional data about the seven BIs and the 71 tenant companies via a range of secondary sources such as websites, organization brochures, annual reports, newsletters and press releases. To reduce the potential of researcher bias, the data collection at the BIs and tenants were divided among five researchers (all prior interview experience). To increase uniformity in the data collection procedure across the different countries, the surveys were developed in English and all interviews were conducted in English.

2.4 The supply side of business incubation

This section focuses on the analysis of the supply side of business incubation by looking at BIs' value propositions. We compare what BIs provide in terms of infrastructure, business support, and access to networks; further, we discuss their selection criteria and exit policies. We group the analysis by generation of BIs.

2.4.1 The value proposition

Infrastructure

No significant differences regarding infrastructure across generations of BIs were found (Table 2.3). All provide key-in-hand office space and the majority also has small workshops and mixed premises for prototyping or small scale production. Reception, clerical services, parking and meeting rooms exist in every BI.

Business Support

BIs of every generation provide coaching to their tenants companies (Table 2.3). There are differences though in the way they provide this kind of service. Erasmus European Business & Innovation Center (EEBIC), Chalmers Innovation (CI) and Normandie Incubation (NI) stated they have in-house coaches: EEBIC and CI assembled a team of experts while within NI the management team is the main source of coaching. Bedrijfs Technologisch Centrum Twente (BTC) and the Innovation Center (IC) provide tenants with outsourced coaches: BTC through one coach who is also an incubator tenant while the IC via a limited group of experts. Technologieförderung Münster (TFM) did not mention formal coaching either in-house or external.

Table 2.3 – Supply of business incubation in the researched BIs

	First generation		Second generation		Third generation		
	BTC	TF Münster	EEBIC	Jülich TZ	Chalmers Innovation	Normandie Incubation	Innovation Centre @DMU
Infrastructure: – Space – Shared resources	BTC provides key in hand office space. Further shared resources include parking, reception and meeting rooms.	TFM provides key in hand office space as well as production facilities and mixed units. Further shared resources include reception, parking and meeting rooms.	EEBIC provides key-in-hand office space as production facilities, laboratories and mixed units. Shared resources such as parking, reception and meeting rooms are also available.	Jülich TZ IC provides key-in-hand office space as well as production facilities and laboratories.	Chalmers provides key-in-hand office space as well as laboratories. Shared resources such as parking, reception and meeting rooms are also available.	NI provides key in hand office space to tenants who only pay for it after graduation and interest-free. No further shared resources are included.	IC provides office key in hand space as well as small production facilities (2 units). Further shared resources include parking and reception.
Business support: – Coaching – Training	Tenants access coaching on an ad hoc basis via incubator manager. One of the tenants is a consultancy firm who provides coahcing on a commercial basis and partially funded by external sources. Further training is offered by the coaches and consists of newsletters..	No formal coaching team exists. Training is offered to tenants in the form of information brochures, emails newsletter or punctual group sessions.	Coaching team of three in-house dedicated experts. Their backgrounds cover fields such as accounting, finance, marketing or engineering.	Coaching is provided by a team of two coaches on a part time basis. Training session such as seminars and workshops are organized on regularly basis in collaboration with Aachen Chamber of Commerce.	Own coaching team of five multidisciplinary experts: accounting, finance, commercial and business consulting experience.	Coaching team of two dedicated project leaders and a coach manager. Their background is mainly scientific.	Coaching is provided by outsourced coaches. Their backgrounds cover fields such as management, marketing or finance.

Table 2.3 (cont.) – Supply of business incubation in the researched BIs

	First generation		Second generation		Third generation		
	BTC	TF Münster	EEBIC	Jülich TZ	Chalmers Innovation	Normandie Incubation	Innovation Centre @DMU
Access to Networks – Professional services – Finance	Access to professional services is provided by request and on demand via incubator staff. ABN is one of the shareholders which might provide financial resources.	Access to professional services is provided by request and on demand via incubator staff. A local savings bank owns 6% of the incubator which might provide financial resources	Professional services such as patent attorneys, legal counseling or strategy consulting are also available. EEBIC also created its own business angel network in 1999 with as office within the premises.	Professional services: one of the tenants is the Technology Transfer Office of that research centre. Also, a legal consulting firm, an insurance company and a project management consulting firm are located within the premises. One shareholder is a local venture capital fund and it is based within the centre.	Close collaboration with Centre for Intellectual Property. Other professional services include contractual agreements with accounting, law and business consulting firms. Chalmers manages its own seed and venture capital funds. Also, it cooperates with local and regional authorities, private venture capitalists and business angels. Chalmers also collaborates intensively with CONNECT.	NI provides a subsidy which can be used for accessing professional services (external advice and expertise) as well as scientific equipment and materials. Access to finance is done via a network of contacts including business angels, public and private financial organizations	The IC is part of a regional network to exchange best practice both for incubators and incubatees which includes a grand total of 16 BIss. Through this network, tenants can access professional services such as training or online support. Through this network, tenants can also access preferred sources of finance.

We considered training as formal organized workshops, seminars and access to complementary information. All generations of BIs provide this service to their tenants. While some frequently organize training sessions about several small business and entrepreneurship topics (EEBIC and IC), others provide further training passively (BTC and TFM frequently distribute newsletters and announcements to their tenants) or grant access to workshops of some of their stakeholders (Jülich Technologiezentrum and CI).

Access to networks

Professional business services are available for all generations of BIs. Access to such services can be provided passively by locating a university technology transfer office as well as consulting firms, insurance companies and project management firms (e.g. Jülich Technologiezentrum) within the incubator's premises. Conversely, Chalmers Innovation (CI) negotiated preferential agreements with major accounting, law and consulting firms to provide their tenants with a minimum level of free hours. Normandie Incubation (NI) subsidizes its tenants to access professional services including usage of scientific equipment and materials. The Innovation Center (IC) grants its tenant firms access to professional services through a regional network of BIs – EMIN, the East Midlands Incubation Network. This network provides the region's incubators with online training, workshops, seminars and frequent consultation with experts. Finally, first generation BIs - the Bedrijfs Technologisch Centrum Twente (BTC) and Technologieförderung Münster (TFM) - are similar to the extent that provision of professional services is done by request and on demand.

Every generation of BIs claims to give access to financial resources to their tenants, apart from the first generation (BTC and TFM). Jülich Technologiezentrum (JTZ) refers to one of their shareholders as the source for venture capital. Conversely, EEBIC and CI established their own business angel network and venture capital fund, respectively. Furthermore, CI cooperates intensively with local venture capitalists. NI and the IC mentioned preferential access to finance resources within their networks.

2.4.2 Selection criteria and exit policy

BIs seldom mention a structured set of selection criteria regardless of their generation. Yet, criteria such as technology focus, innovative products, high growth potential of the company are always preferred. BTC also demands solvability of the company and EEBIC put greater emphasis on the analysis of the entrepreneurial team. TFM houses only biotechnology, nanotechnology and ICT companies. NI is the only one having an extensive selection procedure. In order to be selected, their prospective tenants have to present a business plan to a committee composed of representatives of several shareholders. Additionally, NI provides punctually business plan writing support. Clearly defined exit policies are mostly inexistent across generations of business incubators. EEBIC loosely mentioned time and performance criteria, i.e. companies have to graduate after reaching a certain level of maturity, while BTC, TFM and JTZ did not mention any. The IC has the strictest criteria for exit: all tenants should leave after 36 months of stay within the incubator.

Summarizing, the three generations of BIs do not differ greatly in terms of what they offer to tenants. All generations provide their tenants with the same kind of infrastructure in terms of offices and shared resources. Furthermore, business support is also present in all generations of incubators, apart from TFM which did not mention any coaching/mentoring services. Access to resources is also similar across generations. Also the selection and exit policy are similar among the three generations BIs. Selection criteria are vague and not well defined whereas a clear exit policy is often lacking.

2.5 The demand side of business incubation

This section focuses on the demand side of incubation services by examining the extent to which tenant firms utilize the different dimensions of the value proposition. This is done by enquiring whether tenants make use of the offered infrastructure, business support services, and access to networks. We also take a

closer look at the profile of the tenants in terms of their age, incubation period, size and entrepreneurial team characteristics. We group the tenant firms per generation of BI which allows us to perform statistical analysis in terms of group independence[1]. The selected statistical test was the Kruskal–Wallis test. This one-way analysis of variance method allows us to test equality of population medians among groups.

2.5.1 Business incubation services

Infrastructure was compared using the constructs space and shared resources. Space was described to tenants as available office or workshop space; shared resources was described as any complementary infrastructure related shared service such as reception, car parking, meeting rooms and commodities. We did not find any statistically significant differences between the three generations regarding the usage of infrastructure (Table 2.4).

The situation is different when looking at the extent to which tenants use business support services, either coaching or training. We asked tenants about assigned coaches either part of the BI team or provided through the BI. We found statistically significant differences for coaching ($p \leq .001$). Almost all tenants in third generation BIs used coaching while older generation BIs' tenants are not all using this service: half of the tenants in first generation BIs use coaching while less than a third of tenants in second generation BIs use such services. The results also show statistical difference between the three generations of BIs for the usage of training services by tenants ($p \leq .001$); less than a quarter of both first and second generation BIs' tenants make use of this kind of service. Conversely, the overwhelming majority of third generation BIs' tenants make use of training services.

[1] We grouped the tenants per sector (biotechnology, micro-electronics, ICT, consulting, and other sectors) and performed the same analyses. The results of these additional Kruskal–Wallis tests using sector as a group variable show that the usage of business incubation and the profile of the tenant companies are not statistically different between different industry sectors.

Table 2.4 – Usage of business incubation per generation of incubation centre (%)

	1st generation (N=25)	2nd generation (N=19)	3rd generation (N=27)	p-value
Business support				
Coaching/ Mentoring	48.0	31.6	96.3	≤ .001
Training to develop business skills	24.0	21.1	81.5	≤ .001
Access to networks				
Professional services providers	48.0	63.2	96.3	≤ .001
Seed or venture capital	12.0	52.6	70.4	≤ .001

The access to networks shows the same pattern as the dimensions discussed above. We enquired tenants on the usage of professional business services and access to finance. Professional business services are specialized support services the BI provides in a formalized manner through their network of contacts. These include accounting, legal or administrative support, as well as more specialized services such as strategy consulting or patent attorneys. Data suggests that especially the third generation BIs' tenants made use of professional service providers. Only about half of both the second and third generation BIs' tenants used this kind of service. The differences are statistically significant ($p \leq .001$). The same is true for seed or venture capital ($p \leq .001$). While more than two thirds of third generation BIs' tenants have access to finance, only about half of their second generation counterparts stated the same. First generation BIs' tenants barely declared access to financial means through their BI.

These results show that tenants value differently their BI's value proposition. More third generation BIs' tenants are enjoying the entire service portfolio including infrastructure, business support services, and access to networks than their counterparts housed in older generation BIs. In terms of business support, first generation BIs' tenants enjoy more coaching and training than their second generation counterparts (Table 2.4).

2.5.2 Selection criteria and exit policy: profile of tenant companies

We researched the selection criteria and exit policy by looking at the tenant profile. Tenants' characteristics such as age at entry, share of serial entrepreneurs, and share of relocated companies can be translated in to the selection criteria. We start by looking individually at each one of the variables we considered to reflect the selection criteria. Table 2.4 shows that there is a significant difference between the tenants firms regarding their age at entry ($p \leq .05$). Third generation BIs' tenants are very young (less than one year old) at the moment they enter the BI. First generation BIs' tenants are almost two years old while the firms located in second generation BIs are more than seven years old.

Table 2.5 – Profile of tenants per generation of incubation centre

	1st generation (N=25)	2nd generation (N=19)	3rd generation (N=27)	p-value
Entry age	1.76	7.1	.85	$\leq .05$
Relocated tenants (%)	44.0	52.6	22.2	$\leq .10$
Years in incubator	5.12	5.00	1.70	$\leq .001$
Firm size	3.68	8.21	2.33	$\leq .01$
Serial entrepreneurs (%)	25.0	36.8	53.8	$\leq .10$

We also examine whether there are differences among the firms' entrepreneurial team, in order to complement the tenants' profile. Here, we consider the extent to which the entrepreneurial teams have previous experience in starting businesses.. Table 2.5 shows that the majority of third generation tenant firms are established by entrepreneurs who have previously founded a company. Conversely, less than half of the second generation and only a quarter of the first generation firms have serial entrepreneurs in their team. Summarizing, we find that the profile of the tenants differ significantly between the generations of BIs. Finally, we looked at the

percentage of relocated firms in the BIs at moment of data collection. We considered relocated firms as companies created one year or more before entering the BI. Almost half of the tenant firms of the first generation BIs and more than 50 percent of the second generation BIs were founded one year or more before entering the BI (Table 2.5). Conversely, only about a fifth of the third generation BIs' companies were not created at the incubator's premises or moved there before one year of existence.

We now turn our attention to the exit policies by looking at the length of the incubation period, i.e. the number of years passed since the each tenant's entry to the BIs, and the tenant firms' size. Third generation BIs' tenants stay less than two years in their respective BIs whereas their first and second generation counterparts stay for much longer periods ($p \leq .001$) (Table 2.5). Since the tenants of the first and second generation BIs are significantly older when entering the BI and show longer incubation periods, it is not surprising to see that the first and second generation BIs tenants are significantly larger in terms of employees ($p \leq .01$).

Summarizing, we see that there is a significant difference in the usage of business incubation and profile of the tenant companies between the difference generations of BIs. First and second generation BIs' tenants are older when they enter the BI and typically stay longer incubated than first generation BIs' tenants. This implies that tenant companies in the first and second generation have built greater stocks of knowledge and developed more capabilities and routines than their younger counterparts in the third generation BIs.

2.6 Discussion and implications

Our study conceptualizes BIs in a new theoretical framework that represents the evolution of their value proposition. We confirmed our working proposition of the existence of generations of BIs showing that, indeed, there are differences in the way service portfolios are used by tenants located in BIs established in different points in time. Yet, when looking exclusively at the BIs, we found similar service portfolios. This means that, over time, first generation BIs extended their value

proposition by adding business support services (characteristic for the second generation) and access to networks (characteristic for the third generation) to their offer. We also observed this phenomenon for the second generation BIs, since they added networking to their value proposition. As a result, today's BI landscape appears as very homogeneous in terms of the value proposition. This might be a result of the industry's attempts to standardize BIs through associations (e.g. NBIA, UKBI) and the pressure to comply with the expectations and needs of tenants and the institutional environment. Our findings differ fundamentally from Allen's (1988). Allen (1988) suggested that each BI evolves from an initial focus in infrastructure to business support and only later providing access to networks to incubated companies. Our evidence suggests that other forces may keep BIs in their first stage of development (i.e. focused on infrastructure).

Third generation BIs' tenants are younger, smaller and have shorter incubation periods than tenants housed in first and second generation BIs. These findings suggest that third generation BIs are essentially different from first and second generation BIs in terms of their tenant target group. Third generation BIs are more focused on starting up new companies as shown by the higher number of companies established within the BI; first and second generation BIs have a significantly higher number of relocated companies. Also, these tenants graduate within less than three years on average suggesting that third generation BIs are truly acting as engines for new venture creation. In contrast, the turnover of tenants in the first and second generation BIs is significantly lower. Data suggests that both generations house tenants less likely to use the full range of services available, but for different reasons. Tenants located in first generation BIs enter at young age, remain relatively small and show little growth ambition: only around 10% seek access to external financing such as business angels or venture capital. Conversely, second generation BI's tenants enter at mature age, stay long and are bigger. Also, they are more actively looking to attract external financing which signals more ambition to grow. These phenomena can be seen as the revealed mission of each generation of BIs.

The potential value creation of each generation of BI is quite different than their stated mission. All BIs in our sample claim to be the harbingers of new firm creation as well as having a role in enhancing their tenants long term survival and performance. Yet only third generation BIs are seemingly to contribute actively to new company creation. First and second generation BIs reveal the practice of housing established companies. First generation BIs are selecting young companies, allowing them to stay for a long and not seemingly promoting or encouraging their growth. Second generation BIs recruit more mature companies seeking perhaps to guarantee more stable revenue. Both generations of BIs show a greater concern in renting property instead of creating new companies, particularly the second generation since it allows relatively big companies. Finally, third generation BIs show a great focus in selecting nascent companies and graduate them quickly, keeping a healthy turnover in the incubator and supporting a bigger number of companies. Previous work already assessed different strategies to incubate new ventures (e.g. Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005). Yet our data is more insightful to the extent that it reveals BIs' activities by looking at their tenants rather than at their missions and public activities.

Our results yield several important implications for BI managers, prospective tenants and policy makers. First, third generation BIs can hardly be profitable because they select nascent ventures. Although their tenants are often serial entrepreneurs and therefore more experienced in starting business, they have less well developed business processes and are possibly more aware of their shortcomings. As a result, their tenants are more likely to use the complete service portfolio while in the process of establishing their companies. Being nascent ventures, these tenants do not generate enough revenue to cover the BIs' operational costs for offering business support services and access to networks. Therefore, this generation of BIs requires significant and long-term public funding to be sustainable or other alternatives such as taking equity or a percentage of future turnover of their tenants. Conversely, first and second BIs may aim for a self-sustainable model with limited government funding. The little usage of business support services suggests that first and second generation BIs' tenants are already

experienced, having developed a capability base and a set of business routines. In other words, these companies are relatively more mature and therefore are more likely to have established a stable revenue base. Previous work already suggests that the BIs' business model (profit vs not-for-profit) impacts the nature and quality of the services provided to tenants (von Zedtwitz & Grimaldi, 2006). Yet our results suggest that the generational effect is much stronger. Additional non-parametric independence tests using business model as grouping variable showed no statistical significant differences. Second, if no adequate turnover is promoted and supported by clear section criteria and exit policy, the tenants will have developed skills and capabilities through experience and do not require business support services anymore. This is even more pronounced when first generation BI added access to networks to its service portfolio. Our results show that first and second generation BIs select older tenants that stay longer in the BI thus needing less business support services and access to networks than newly founded ventures. BIs' service portfolio is established and geared towards supporting nascent and young companies. We extend previous work that links differences in usage of incubation services according to the venture's stage in its lifecycle (e.g. McAdam & McAdam, 2008) by providing evidence that not only each service becomes less important but it also might be unnecessary.

Third, going from infrastructure to coaching and networking turns out to be a very difficult step for BIs and involves much more than establishing an extended service portfolio. First and second generation BIs extended their value proposition while not adjusting their selection criteria and exit policy. In fact, most BIs in our sample do not have clear selection criteria and exit policies in place. We found that first and second generation BIs are selecting more mature companies and, in case of second generation BI, even beyond the typical incubation period of three years (EC, 2002). The length of the incubation period is also much higher in first and second generation BIs. As a result, a mismatch between the tenant profile and the services being offered emerges and, ultimately, renders those services inadequate. Therefore, BI managers should be more aware of the impact of updating their value proposition. Adding dimensions such as business support and access to networks

only makes sense if combined with adequate management practices. Appropriate selection and exit procedures guarantee the admission of tenants who will be more likely to use services such as business support or networking and assure that tenants graduate timely. Since the value proposition for the three generations is similar, all generations of BIs should accommodate new ventures as they are most likely to use all three components: infrastructure, business support, and access to networks.

Prospective tenants should look at their future fellow tenants to better assess the appropriate BI. While this may sound counter-intuitive, it informs better prospective tenants than checking the BIs' offering. As shown, BIs tend to standardize their value proposition and state similar mission across generations. Yet our analysis of tenants' population and the extent to which they use business support and access to external networks uncovers a different picture; For example, if the prospective tenant is looking for a dynamic, vibrant environment then it should look for a third generation BI. Here, the prospective tenant will be confronted with fellow tenants that are confronted with similar challenges thereby offering more opportunities for mutual learning and exchange of experiences.

We also inform policy makers that they should be more aware of the extent to which different generations of BIs affect their tenants. If the ambition of policy is to stimulate and support new venture creation then planning to upgrade older generations of BIs is counterproductive if not accompanied by a simultaneous shift in management practices. More specifically, policy makers should enforce BIs' managers to adjust their selection criteria and exit policy ensuring support to nascent companies and a healthy turnover of tenants. However, our findings reveal that BIs do not always implement their stated selection criteria and exit policies. This calls for further monitoring of BIs' operations and practices to ensure their contribution to policy objectives. A possible reason for not changing these procedures might be found in the financial goals of the BIs. Renting property is an important base for the sustainability of BIs, one cannot expect them to change the tenant population from stable tenants to the more insecure group of nascent entrepreneurs without any financial compensation.

2.6.1 Limitations and further research

This study is not without limitations, which provide avenues for future research. Our paper is based on a detailed analysis of seven incubators and 71 tenant companies. Future research should use larger scale studies to provide further validation of our findings. Also, a longitudinal examination of the BIs' service portfolio and usage of these services by tenants over time could bring more insights into the dynamics of business incubation.

Further research can start by developing our theoretical framework further. Our analysis suggests that anchoring BIs in three dimensions is useful. Yet when discussing the results, long term strategic goals elements of the BI emerged as possible explanations for our findings. As a result, our framework would be greatly improved by adding BIs' features beyond service provision such as business model.

While beyond the scope of this paper, an interesting avenue for future research is to study the impact on performance of tenants that have been located at different generations of BIs. The three identified generations of BIs house tenants with very different characteristics. Tenants of third generation BIs are new firms created by serial entrepreneurs whereas first and second generation BIs' tenants are typically older when they enter the BI and founded by novice entrepreneurs. By taking these differences between the three generations of BIs into account, future studies may reconcile some of the contradictions in studies on the performance implications of business incubation.

From a methodological point of view, we focused on incubators that offered physical office space and did not include virtual incubators (Durão, Sarmento, Varela, & Maltez, 2005; Nowak & Grantham, 2000). This type of business incubator focuses efforts on providing business expertise and facilitating access to strategic partnerships (Nowak & Grantham, 2000). It does not, however, offer the key function of the first generation: economies of scale through shared infrastructure and basic services. Future research that also considers this very recent type of business incubator may complement our findings.

Another addition to our study would be to collect additional data for each service in at least two ways: the method/quality of provision and the intensity/frequency of provision. For example, although every BI claims to provide coaching to its tenants, significant differences exist in the way coaching is provided and between the background/experience of the coaches. Additionally, the time dedicated to each service potentially differs across BIs. Future research should take this into account and thereby complement the insights of this study.

2.7 Conclusions

We set out to research whether there are differences between the value propositions of each generation of BIs and the extent to which the service portfolio fits tenants of each BI generation. Based on seven case studies representing the three generations of BIs, we observe no significant differences across generations in terms of their service portfolio. However, using survey data of 71 tenants collected within the same seven BIs, we find that only firms located in third generation BIs make full use of the service portfolio. Also, older generations BIs select older tenants and allow them to stay longer. This suggests that a lack of selection criteria and exit policies towards creating a portfolio of nascent companies within the BI are at the root of the mismatch between supply and demand for business incubation. Our findings also indicate that BIs might experience a kind of an imprinting effect: older generation BIs are not capable of fully adapting to the newer models of incubation not so much because of difficulties in establishing new services, but due to rigidities in their management practices. We hope that our study encourages researchers on business incubation to take our approach as a departure point for large scale longitudinal studies.

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Chapter 3

Are Technology Business Incubators Different? An Examination of Service Portfolios And Selection Strategies

This chapter is based on:

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Abstract

Policy makers increasingly recognize the importance of new ventures to foster job and wealth creation. Among a variety of initiatives, business incubators (BI) are central to the support of new venture development. There are different types of incubators that cater to different types of new ventures: technology business incubators BIs (TI) and non-technology business incubators BIs (NTBI). We pose the question of whether there are differences between TI and NTBI in terms of service provision levels, selection criteria and exit policy investigating 12 BI located in North-western Europe. Group comparisons show that TIs provide a bigger proportion of tenants with a broad service portfolio, select younger companies and practice stricter exit policies. Our findings suggest that the different selection criteria and the non enforcement of a clear exit policy are at the behind the lower levels of services provision among NTBIs. Our contribution is towards a better understanding of the TIs' operation and management practices.

Keywords: Business Incubators, Business Support, Entrepreneurship, Technology Incubation

3.1 Introduction

Business incubators (BI) are often established as catalysers to technology transfer between universities and industry. Vigorously supported by governments and regional authorities, BIs support new technology-based ventures (NTBV) and thereby strengthening the regional economic fabric (Lewis, 2010). As a result, incubators have a positive role in regional job and wealth creation. Universities have been actively promoting BIs and supporting incubation activities as part of their strategy to facilitate the establishment of spin-off companies (Mustar & Wright, 2010) and commercialize new knowledge (Becker & Gassmann, 2006a; O'Gorman, Byrne, & Pandya, 2008). In fact, the existence of BIs next to universities indicates the interest of the university in promoting spin-off activity and contributing to regional economic growth (O'Shea, Allen, Chevalier, & Roche, 2005; O'Shea, Chugh, & Allen, 2008).

Literature identifies several categories of BIs (e.g. Carayannis & von Zedtwitz, 2005; Grimaldi & Grandi, 2005). Technology business incubators (TIs) are those more focused in incubating technology-based or science-based new ventures. The last available figure for the North American population of BIs shows that about 39% of them are TIs, making them the second most frequent after mixed-use BIs (54%) (Knopp, 2007). TIs' benefits to technology transfer and commercialization of new knowledge emerging from universities has long been suggested (Lewis, 2005; Tornatzky, Sherman, & Adkins, 2003). The impact of TI on the economy is rooted in Schumpeter's work: economic growth is sustained by entrepreneurs entering the market with innovative products or services (Schumpeter, 1942). More recently, Audretsch (2007; , 2009) suggested that entrepreneurship is the mechanism through which new knowledge is brought to the market, creating new products and services. These insights provide the basis for the commonly seen assertions of the benefits of TIs for job and wealth creation. Although some of these functions (e.g. university linkages) have been already researched in detail (Rothaermel & Thursby, 2005a),

little evidence exists about how TIs differ in their operation when compared to remainder to the general population of BIs.

Bergek and Norrman (2008) single out selection of tenants, business support and network access as the most important features in differentiating BIs (p. 23). This concurs with previous work suggesting that each type of BI provides their tenants with a different range of support services (von Zedtwitz & Grimaldi, 2006). At the same time, it raises many questions about how these features can be related and whether there is a causal relationship between them. Bergek and Norrman (2008) provide empirical evidence on some of the possible combinations in terms of selection strategies, business support and network access (p. 26) but say little about how those are interrelated. In fact, research has so far not discussed thoroughly the possible relationship between management practices such as selection criteria and effective service provision to tenants.

We investigate the differences between TI and Non-technology business incubators (NTBI) by comparing them in terms of services provided to tenants and management practices. We build on Peters et al. (2004) and identify three dimensions along which BIs function and subsequently compile a list of business services. We also investigate BIs selection strategy and exit criteria as these are management practices which have been identified as critical to the effectiveness of BIs (Aerts, Matthyssens, & Vandenbempt, 2007; J. R. Lumpkin & Ireland, 1988; von Zedtwitz & Grimaldi, 2006). Our empirical data was collected in both BI and their tenants, providing a more comprehensive dataset than most BI studies.

This paper is structured as follows. We start by discussing characteristics of BIs the theoretical lens on business incubation (Section 3.2). Section 3.3 discusses the methodology, sample characteristics and data collection. After presenting the results (Section 3.4), we discuss those furthering explanations for the differences between the types of BIs (Section 3.5). Finally, we discuss the managerial implications for business incubators, policy makers and prospective tenants (Section 3.6).

3.2 Business Incubators: definitions, support portfolio and incubatee selection strategies

3.2.1 What are business incubators?

The growing body of research on BIs has advanced a plethora of definitions for incubation. Despite the relative maturity of BIs both as practice and as a research field, a consensual definition for BIs is yet to be found. In their comprehensive BI research overview, Hackett and Dilts (2004b) offer that a "business incubator is a shared office space facility that seeks to provide its incubatees (…) with a strategic, value-adding intervention system of monitoring and business assistance" (p. 57). This echoes the commonalities found between other definitions put forth by industry associations (NBIA, 2007; UKBI, 2007), large scale studies (EC, 2002; OECD, 1997, 1999) and academic work (e.g. Aernoudt, 2004; Sherman & Chappell, 1998; Smilor & Gill, 1986). In sum, BIs are mostly property based organizations (Phan, Siegel, & Wright, 2005) and provide their tenants a mix of services comprising infrastructure, business support services and networking (Bergek & Norrman, 2008; Hansen, Chesbrough, Nohria, & Sull, 2000; Lalkaka & Bishop, 1996; Peters, Rice, & Sundararajan, 2004). These aim respectively at reducing costs, accelerating the learning curve and granting access to professional networks to tenants firms.

3.2.2 Dimensions of business incubation

Hackett and Dilts (2004b) classify most BI studies as atheoretical (p. 74). In fact, apart from their own theoretical contributions (2004a; 2007), business incubation research is lagging behind other similar fields in theory development. We attempt to remedy this situation discussing three fundamental dimensions of BI and their respective theoretical basis.

Infrastructure

The concept of business incubation is inextricably tied to infrastructure (Phan, Siegel, & Wright, 2005). Infrastructure is associated with space and shared resources. Space is generally an office rented to tenants at or below market prices. In addition, BIs often have small production facilities or mixed units (offices combined with small workshops) available to their tenants. Provision of space is critical to business incubation. Empirical evidence suggests it to be the most beneficial feature to tenants (Chan & Lau, 2005), particularly for those in early stages of development. General shared resources such as reception, clerical services, meeting rooms, conference rooms or car parking (EC, 2002; McAdam & McAdam, 2008) are often bundled together with the office rental. Specialized shared resources such as laboratories or research equipment can also be part of the BI's infrastructure (Grimaldi & Grandi, 2005).

The provision of space together with shared resources impacts nascent firms on various levels. First, overhead costs are reduced for the tenants. BIs provide their tenants with services they probably would not easily access if located elsewhere. Also, the burden of planning, setting up and the costs associated with a series of individual providers is inexistent within a BI. Car parking, meetings rooms, reception and clerical services are examples of valuable shared resources. Second, tenants located inside a BI display a signal of quality and increase their external credibility. All BIs have more or less extensive selection procedures. This means that being accepted to a BI signals the nascent firm as promising in terms of innovativeness and growth. External legitimacy has a positive impact on young firm's survival even in situations of resource scarcity (Singh, Tucker, & House, 1986). Finally, putting firms under the same roof and sharing significant parts of the infrastructure increase the chances of synergies between them to arise. Knowledge sharing, formal alliances, buyer-seller relationships are examples of these synergies.

The rationale for infrastructure services can be found in economies of scale. BIs tend to have high setup costs, but much lower operating fixed costs and declining marginal costs. After a certain space has been built, the operating costs of BI consist

mainly on the shared resources listed above. The costs of providing one more tenant with the infrastructure (space and shared resources) decrease as the number of tenants increases. To a lesser extent, economies of scope are also present when establishing and managing a BI. In fact, BIs often bundle infrastructure with shared resources. Tenants normally pay rent for office space including shared resources; those cannot often be paid separately from infrastructure.

Business support

New firms often lack organizational routines and have little experience with management processes. This results in a higher death propensity, particularly in early stages. This "liability of newness" has been extensively studied since Stinchcombe coined the term in his 1965 seminal work (e.g. Brüderl & Schussler, 1990; Henderson, 1999). The liability of newness can be reduced by external credibility (Singh, Tucker, & House, 1986), as discussed in the infrastructure section. In addition, business support services, such as advice from experienced trainers and other entrepreneurs, can provide valuable help to accelerate the venture's learning curve. By enjoying business support services, the incubatees can make better and faster decisions, which results in higher firm performance (Eisenhardt, 1989). Furthermore, training sessions on relevant topics increase the human capital of the entrepreneur and therefore have a positive impact on new venture development and performance (Colombo & Grilli, 2005; Davidsson & Honig, 2003).

Business support is an integral part of business incubation and arguably its most complex dimension. Previous work on business support identified four typical services: coaching, training, business plan support and direct subsidies. Coaching is often referred as the most important service business incubators can provide to their tenants (Hansen, Chesbrough, Nohria, & Sull, 2000; Mian, 1996). Within a coaching program, each incubatee is assigned one coach when admitted to the incubator. Meeting with the coach can be compulsory or on demand. BIs which do not possess in-house coaching expertise may facilitate access to a coach through their network of contacts. Coaching services have already been found in literature as

critical to tenants' timely graduation (Peters, Rice, & Sundararajan, 2004) and as having a potentially positive impact on firm development (Robson & Bennett, 2000).

Training is also often available from BIs (Aerts, Matthyssens, & Vandenbempt, 2007; Barrow, 2001). Trainings are less interactive and more general in content than coaching sessions. Training tools range from a training session on a specific topic to newsletters or access to common communication platforms. A particular training content that is offered by BIs is training for writing a business plan. Young ventures need to write and update their business plans as this is an often seen tool to gain access to potential investors (e.g. Delmar & Shane, 2003; Honig & Karlsson, 2004). BIs were found to provide assistance in business plan writing, particular when they include idea development in their activities (Peña, 2004). Peña (2004) found training within BIs to have a positive influence on tenants' performance. Lastly, BIs can also provide direct subsidies to companies (Peña, 2004) to complement their business support services.

Access to networks

Access to business services or financial resources via networks of professional contacts is also part of the incubator concept (Hansen, Chesbrough, Nohria, & Sull, 2000; Sofouli & Vonortas, 2007). Access to networks stimulates external collaborations and constitutes an important source of resources. Empirical evidence suggests that access to specialized networks is critical for the development of tenant companies (McAdam & McAdam, 2008; Patton, Warren, & Bream, 2009). Access to financial resources is also often offered by BIs (Aerts, Matthyssens, & Vandenbempt, 2007). Connections with business angel networks and venture capital firms are important means of providing financial resources during early stages of tenants' development.

Social capital can compensate the lack of resources of a new venture (e.g. Portes, 1998). Previous work provided empirical evidence of the important role of social capital in building human capital (Coleman, 1988) and its impacts on firm performance (Davidsson & Honig, 2003; Yli-Renko, Autio, & Sapienza, 2001).

New firms seldom have access to established networks to compensate their lack of human and financial resources. For instance, accessing professional business services such as specific advice on a given expertise (e.g. IP regulation) might be too costly for a nascent firm. BIs provide assistance by brokering connections to professional services (e.g. Allen & McCluskey, 1990; Peters, Rice, & Sundararajan, 2004) such as specialized consultancy (OECD, 1997).

New firms often need external finance for development. BIs do no often subsidize directly their tenants. However, BIs try to address this nascent firms' need by creating relevant networks of business angels and venture capital firms. The provision of this service might have an important indirect impact on firm's development. Venture capitalists typically have a control function, supervising the firm's activities to ensure their own investment as well as a support function to support the growth of their portfolio companies. As a result, venture capitalists contribute to the firm's development by covering their financial needs as well as professionalizing organizational structure and managerial processes (Hellmann & Puri, 2002).

3.2.3 Incubatee selection strategy

Selection criteria are among the most important management features of business incubators (Aerts, Matthyssens, & Vandenbempt, 2007; J. R. Lumpkin & Ireland, 1988). These procedures impact on the population of incubated companies as well as the effectiveness of the BI. New firm's needs vary according to their development (e.g. Kazanjian, 1988; Vohora, Wright, & Lockett, 2004) as well as different businesses require distinct support mechanisms (G. Gorman & McCarthy, 2006; Wright, Birley, & Mosey, 2004). Therefore, the more heterogeneous the population of a BI is, the more difficult it will be to provide them all with a fitting business support portfolio and useful network of contacts. Selection criteria typically include financial ratios (liquidity, profitability), personal traits of the entrepreneurial team (skills, experience) and market factors (business plan, innovativeness of product or service) (Aerts, Matthyssens, & Vandenbempt, 2007;

J. R. Lumpkin & Ireland, 1988). Aerts and colleagues (Aerts, Matthyssens, & Vandenbempt, 2007) showed that tenants perform better when selected by BIs using more of those selection factors.

Exit policy is an equally important and determinant management practice for BIs. There is little evidence that BIs define clear criteria for companies to leave the BIs' premises. Some authors report graduation to be decided on a case-by-case basis (Rothaermel & Thursby, 2005a, p. 1080). On average, large scale studies report a graduation time of 3 years (EC, 2002). Other exit policies include income level, performance indicators agreed between the tenant and BI (Peters, Rice, & Sundararajan, 2004) or specific deadlines (Allen & McCluskey, 1990; Peters, Rice, & Sundararajan, 2004) set by the BI. In practice, BIs often incrementally increase rental rates to induce tenant graduation (Allen & McCluskey, 1990; Peters, Rice, & Sundararajan, 2004).

3.3 Methodology

3.3.1 Research setting – the Nensi project

We investigated a total of 12 BIs located in six Northwestern European countries. All BIs were part of Nensi – North European Network of Service Incubators, an EU funded project which ran from 2005 until 2008. During this period, data on both BIs and their respective tenants were collected (for a detailed description of the full data collection instruments see Jenniskens, 2006).

We identified TIs as those BIs which fulfil at least two of the following criteria. First, TIs must have a clear a mission statement endorsing the creation of NTBV. BIs that are strategically oriented this way are more likely to incubate NTBV than their counterparts. Second, TIs must have strong links to a research oriented university or other research centres. Such BIs are closer to sources of new knowledge and therefore more likely to help creating and supporting NTBV. In fact, the existence of a university sponsored TIs is a clear signal that the university is

committed to commercialize its new knowledge through the creation of new companies (O'Shea, Allen, Chevalier, & Roche, 2005; O'Shea, Chugh, & Allen, 2008) and constitutes increasingly a new source of revenue (Friedman & Silberman, 2003). Lastly, TIs ought to be geographically close to a university campus, other research centres, or located within science or research parks (e.g. Kang, 2004; Link & Link, 2003). These BIs are more likely to nurture university spin-offs due to their location (Audretsch, Lehmann, & Warning, 2005). If two out of these criteria are met, an incubator is labelled as a TI; the remainder are labelled as NTBIs Based on our definition, we found 5 TIs and 7 NTBI in our sample (Table 3.1).

The TIs have similar characteristics. All of them were founded by universities and are still located within their premises. The exceptions are Emergence and the TechnologiePark Münster which are located closely to university campus and research institutions. However, these two TIs were explicitly established to support regionally the creation and development of high-tech companies. All TIs show a clear mission towards the support of technology based ventures. NTBIs share common charateristics among themselves. Promoted by other organizations than research universities and located in urban locations, NTBIs do not show any particular focus on supporting NTBV. The exception is the BTC which is located close to a university campus and has among its shareholders a technical research-oriented university. Yet its mission is not clearly directed at supporting new technology based ventures but rather service companies (Table 3.1).

Table 3.1 – Typology of the researched business incubators

Country	Incubator	Mission statement	University linkages	Location	Focus
Netherlands	BTC	"Focus on knowledge intensive companies and organizations specialized in "high-tech" or high value services" (quotes on the original)	The University of Twente (research university) and Saxion (applied sciences university) are among the shareholders.	Campus / Business and Science Park	Mixed use
	Campus Business Centre	No clear mission found. Campus assumes itself as office rental while mentioning network of professionals for providing support to early stage ventures.	Owned and promoted mostly by ROC van Twente (Regional Educational Centre)	Urban	Mixed use
	Masterdam Ondernemers Centrum	Masterdam positions itself in bridging the gap between the education at ROC ASA and companies.	Owned and promoted mostly by ROC ASA (Regional Educational Centre)	Campus	Mixed use
UK	EPIC - Eliot Park Innovation Centre	No clear mission found. If you are a technology and knowledge based small to medium sized enterprise then EPIC is the ideal environment for you to grow and develop, although all enquiries are considered"	Promoted by Coventry University Enterprises, a for profit subsidiary of Coventry University.	Urban	Mixed use
	EMIN - Innovation Centre	Focused in supporting high-tech new ventures.	Founded by DeMontfort University (research university)	Campus	Technology based
	EMIN - Sparkhouse Studios	"Help new-start businesses grow and develop by providing them with the best possible advice and support available". Focus in the field of creative industries.	Founded by the University of Lincoln.	Campus	Technology based

Table 3.1 (cont.) – Typology of the researched business incubators

Country	Incubator	Mission statement	University linkages	Location	Focus
Ireland	DCEB - Guinness Enterprise Centre	"To provide incubator space (…) to new and established small businesses, primarily in software services oriented businesses, light hi-tech prototype engineering and international/technological traded services, E-commerce, multi-media, internet and mobile software development"	No linkages found.	Urban	Mixed use
	DCEB - iCELT	No specific mission found for the business incubator. The BI is however "home to a number of knowledge intensive start-up companies working in the areas of finance, education and learning technologies".	Founded and promoted by the National College of Ireland (teaching oriented university)	Campus	Mixed Use
	DCEB - Terenure Enterprise Board	"To provide practical, realistic support and training to all members in the community, with priority for disadvantaged members."	The Community Enterprise Society Limited is a voluntary organisation with charitable status established in 1984.	Urban	Mixed use
France	Emergence	Emergence was created as a "tool (…) for company creation, aimed at supporting young technology based companies to start, develop and survive."	Although geographically located close to Universities and Research Centers, the centre is not formally connected to any.	Campus / Business Park	Technology based Focused on young ventures
	Normandie Incubation	Housing and support of "innovative enterprise creation projects based in Lower Normandy."	Founded by the University of Caen Lower Normandy, the National Graduate School of Engineering in Caen and the one public research laboratory.	Campus	Technology based Focused on pre starters
Germany	TechnologiePark Münster	"Promotion of innovations and technologies and the consultancy in the formation and growth of technology-oriented firms."	Although geographically located close to Universities and Research Centers, the centre is not formally connected to any.	Urban	Technology based

3.3.2 Methodology of data collection

During the Nensi project, we collected data on both business incubators as well as their tenants (for a detailed description of both questionnaires and the monitoring tool see Jenniskens, 2006). We sent questionnaires to BI managers asking about their mission, strategy, focus, stakeholders, university linkages, location as well as selection criteria and exit policies. We performed site visits to all BIs after collecting all the questionnaires to confirm the data collected though the questionnaires as well as to clarify some answers. All visits in included interviews with the incubation managers and/or other key staff. These interviews were semi-structured and the script based mostly on the analysis of the returned questionnaires. This allowed us also to clarify some responses in the questionnaires and to confirm some of the data already collected by alternative wording of the same questions (Fowler, 1995). Finally, this data was further triangulated with compiled information in the public domain (Yin, 2003).

The questionnaire sent to tenants contained questions on the several dimensions of business incubation. An initial version of the tenants' questionnaire was used as script for semi-structured interviews to tenants of a selected BI. This procedure enabled us to assess the time needed to fill out the questionnaire as well as to correct some ambiguities in the questionnaires (Dillman, Smyth, & Christian, 2008). We asked tenants about the availability of infrastructure, business support services and access to networks within their respective BI. Demographic data such as age of venture, age at entry, sector of activity and teams' experience was also collected. Data on tenants was collected by incubator staff. We asked the incubation managers or other key staff within the incubator to manage the data collection process in each incubator. This way we covered a bigger sample of tenants. From the initial call to 354 companies, 101 returned valid questionnaires (29%) (Table 3.2).

Table 3.2 – General characteristics and data availability of the researched business incubators

Country	Incubator	Year of Foundation	Size (m^2)	# companies	# valid answers	
Netherlands	BTC	1982	4700	68	11	16%
	Campus Business Centre	2005	5000	49	18	37%
	ROC ASA	2006	300	10	4	40%
UK	CUTP - EPIC - Eliot Park Innovation Centre	-		17	2	12%
	EMIN - Innovation Centre	2001	640	18	6	33%
	EMIN - Sparkhouse Studios	2003	320	10	6	60%
Ireland	DCEB - Guinness Enterprise Centre	1997	4000	67	7	10%
	DCEB - iCELT	2004	1300	13	3	23%
	DCEB - Terenure Enterprise Board	1985	750	25	6	24%
France	Emergence	1995	650	16	13	81%
	Normandie Incubation	2000	300	19	14	74%
Germany	TechnologiePark Münster	1985	6900	42	11	26%
Total				354	101	29%

3.3.3 Variables

Business services

BI services were operationalized using dichotomous variables for each service within the three dimensions discussed in 3.2.2. We investigated a total of nine business incubation services asking asked tenants about the usage of each of the nine services (yes/no). *Infrastructure* was measured asking tenants about availability of space and shared resources. Under *business support services* we put internal coaching, training, business plan writing and direct subsidies. *Access to networks* was measured using the variables external coaching, brokerage and seed/venture capital.

Selection criteria and exit policy

Selection criteria and exit policy were captured by using two variables for each. Selection criteria can be proxied by the entry age of tenants. Different entry age of tenants reflects different strategic orientation of the BIs. For instance, accepting older tenants implies a focus on supporting companies already established while admitting younger tenants means the BIs focuses on nascent companies. Additionally, we included a question on the difficulty to get accepted within the BI (dichotomous variable). This will approximate the extension and complexity of the selection procedures. Similarly, exit policy can proxied by the current tenants' age. For instance, older tenants imply a weak exit policy resulting in housing companies beyond the typical incubation period. Additionally, we asked tenants whether they know when to leave the incubator. Negative answer can be translated in lack of exit policy.

Tenants' characteristics

Finally, we enquired on characteristics of the entrepreneurial teams. These include experience (in total years of working), specific preparation in entrepreneurship, start-up experience (yes/no), current number of employees and if any member of the team had previous experience in starting businesses.

3.4 Results

An important finding of this study is that TIs and NTBIs differ in two out of three of the researched incubation dimensions (Table 3.3). TIs provide almost all their tenants with infrastructure, business support services and access to networks while NTBIs only come close to providing the entirety of their tenants in the infrastructure dimension. In the business support and access to networks dimensions, TIs have higher levels of service provision to their tenants than NTBIs. Although not covering the entirety of tenants, TIs provide business support and network services to around 90% of their population of housed firms. Only direct subsidies (business support) and seed/venture capital (access to networks) are provided to less than 80% of the tenants (Table 3.3).

NTBIs have lower levels of service provision in on both the business support and access to networks dimensions. Business support services are provided to less than 70% of housed firms. Only training scores higher (77.5%); direct subsidies score much lower (48.4%). In terms of access to networks, only brokerage is provided to levels that are comparable to TI (more than 80%). External coaching and seed/venture capital are provided to less than half of NTBIs' tenants. Nonparametric independence tests reveal statistically significant differences. We found that the levels of provision of services in any dimension are statistically significant (p value ≤ 0.05), with the exception of infrastructure and brokerage (Table 3.3).

We performed Mann-Whitney non-parametric significance testing to assess whether both groups have statistically significant values. Results show statistically significant differences in selection criteria and exit policy variables between TIs and NTBIs (Table 3.4). TIs tend to select younger companies (average entry age = 0.76 years) and use a more sophisticated selection procedure. This is shown by the small proportion of their tenants who found the process of selection not difficult (28.0%). Also, a larger proportion of companies is know when to leave the incubator (34.7%) and tend to graduate timely (average current age = 3.02 years).

Table 3.3 – Service availability in the researched business incubators

Service (%)	TIs (N=50)	NTBIs (N=51)	p value
Infrastructure			
Space	100.0	100.0	n.s.
Shared resources	100.0	100.0	n.s.
Business support			
Internal coaching	93.9	71.7	≤ 0.05
BP support	88.5	60.6	≤ 0.05
Training	93.9	77.5	≤ 0.05
Direct subsidies	78.4	48.4	≤ 0.05
Access to networks			
External coaching	90.5	50.0	≤ 0.01
Brokerage	90.5	81.1	n.s.
Seed/venture capital	76.5	38.2	≤ 0.05

Conversely, NTBIs select more mature companies (average entry age = 3.02 years) which are selected to enter in the incubator through an easier procedure. 64.7% of NTBIs' tenants found it not difficult at all to get accepted within the incubator. Furthermore, the majority of tenants do not have any obligation to leave (only 16.3% know when to leave the BI) and are, on average, older than the typical incubated company (average current age = 5.45 years). All differences are statistically significant (p value ≤ 0.05).

In terms of tenants' experience and background, our results show that TIs are attracting significantly more teams than single entrepreneurs (p value ≤ 0.01), who also have more accumulated working experience (p value ≤ 0.10). Yet no statistically significant differences are observed in terms of specific entrepreneurship background or experience in founding prior businesses. Finally, employment is approximately the same on average among both TI and NTBI tenants. The difference is not statistically significant.

Table 3.4 – Employment, selection criteria, exit policy and entrepreneurial teams' background in the researched business incubators

	TIs (N=50)	NTBIs (N=51)	p value
Employment	3.08	3.33	n.s.
Selection criteria			
Average entry age (years)	0.76	3.02	≤ 0.01
% of not difficult entrance	28.0	64.7	≤ 0.05
Exit policy			
Average current age (years)	3.02	5.45	≤ 0.05
% of knowing when to leave	34.7	16.3	≤ 0.05
Entrepreneurial teams background			
% team start	72.0	42.0	≤ 0.01
% serial entrepreneurs	29.2	29.2	n.s.
% entrepreneurship preparation	40.0	46.9	n.s.
Average accumulated years of experience (years)	21.0	14.0	≤ 0.1

3.5 Discussion of results

We compared TIs' and NTBIs' service provision level to understand the differences between these two groups of incubators. Statistically significant differences were found in every incubation dimension apart from infrastructure (premises and shared resources). The fact that infrastructure is equally provided by TIs and NTBIs is unsurprising since our survey was only administered to companies who were physically located within the incubators. Although the concept of virtual incubation has been progressively gaining notoriety as a way to support new ventures without physical premises (Nowak & Grantham, 2000), most BIs are still property based (Phan, Siegel, & Wright, 2005). Group comparisons of brokerage, a service part of

the access to networks dimension, also show no statistically significant difference. This means that both types of BIs provide the same share of their tenants with access to professional contacts.

TIs have stricter and more sophisticated selection procedures while showing also exit policies in line with typical BIs' three year benchmark for graduation (EC, 2002). These differences in the tenantn portfolio might be related to the differences found in the levels of business services usage. Firms' needs vary throughout their various stages of development (Kazanjian, 1988; Vohora, Wright, & Lockett, 2004) and there is empirical evidence that this is also true in the context of incubation (McAdam & McAdam, 2008). Not surprisingly, NTBIs housing older tenants show different patterns of service usage than TIs housing younger ones tenants. BI services are especially designed to support companies during their first states of development. Due to strong industry associations, such as the NBIA in the United States of America or the UKBI in the United Kingdom, it is likely that every newly established BIs attempts to provide the same set of services. Unfortunately, this might happen regardless of the specific mission of each BI, the surrounding environment and the target population of tenants. Services such as coaching or training might be useful for every company while other such as seed/venture capital or writing business plan are only meaningful to nascent companies. We observe that the TIs in our sample are providing much more of their tenants with coaching (93.9%), training (88.5%) business plan assistance (88.5%) and seed/venture capital (76.5%) than NTBIs; all the differences are statistically significant. Although providing fewer companies with services, NTBIs still have significant proportions of tenants using services such as training and internal coaching, for instance. This is potentially an effect of NTBIs having a more diverse population of tenants in terms of age (standard deviation NTBIs = 5.85; TIs = 2.67) (Table 3.4). This heterogeneity among the tenant population and the observed differences in the service provision levels suggest a mismatch between the service portfolio of each BI group and their tenant population. Our results suggest that lower levels of the service portfolio usage might be a consequence of weaker selection criteria and

non-enforced exit policies. This points to a necessity of aligning selection criteria and exit policies, on the one hand, to the service portfolio, on the other.

The reason behind weak selection criteria and slack exit policies might be the result of conflicting goals between the several shareholders of a BI (OECD, 1997). The profitability of a property-based BI and the longer term goals of supporting NTBVs might be conflicting goals that are practically impossible to achieve simultaneously. In our sample, most NTBIs are owned and promoted by private organizations or several stakeholders among which research institutions are not always present (Table 3.1). Therefore, these NTBIs are less likely to engage in technology transfer and will tend to focus on generating revenue. This is visible in the average entry age of tenants (5.45 years). In fact, it is known that some BIs accept accountants, financial services and insurance companies (OECD, 1997) which leads to them providing support to fewer companies (Quintas, Wield, & Massey, 1992; Ratinho & Henriques, 2010). Two other factors might also contribute to NTBIs' relaxed selection criteria and exit policy. Firstly, literature suggests that TIs are typically non profit organizations (Carayannis & von Zedtwitz, 2005; von Zedtwitz & Grimaldi, 2006) as the majority of their income comes from public funding and only partly from their tenants' fees (Grimaldi & Grandi, 2005). There is therefore less pressure to fill the available space with companies. Secondly, we see that the NTBIs in our sample are systematically larger than TIs. Size combined with the for-profit strategic objective provides a strong incentive for NTBIs to relax their selection criteria and exit policy. This strategy is lucrative, and perhaps even inevitable, to achieve financial stability that is needed to maintain the infrastructure occupied with companies. The focus on infrastructure leads to accepting companies which are less likely to need any services beyond infrastructure, and to a lax formulation and enforcement of exit policies.

The higher levels of service provision found in TIs suggest that they have closer contact to a bigger proportion of their tenants. For instance, coaching and training services are used by a significantly higher proportion of TIs' tenants than NTBIs' tenants. Due to the nature of these services, this means that TIs are following,

supporting and accompanying much closer and potentially more frequently more tenants their counterparts. Rice (2002) suggested that BIs that engage in more business support activities and devote more time to those same activities are likely to have more impact on their tenants (Rice, 2002). Therefore, we argue that TIs' graduate companies will be much more capable of growing and surviving standing on their own than NTBIs'. The reason behind these expected differences in the profile of the graduate companies is a result of the more complete intervention of their BI during the incubation process.

Our results also point to some differences between TIs and NTBIs in terms of their tenants' characteristics. TIs attract more experienced entrepreneurs in terms of work experience and more entrepreneurial teams than single entrepreneurs. The positive role of teams in technology based firms per romance has been extensively discussed in literature (e.g. Colombo & Grilli, 2005). It is therefore be likely that TIs, which focus specifically in supporting NTBVs, would host more entrepreneurial teams than single entrepreneurs when compared to NTBIs. Similarly, it has been shown that TIs attract more experienced entrepreneurial teams (Colombo & Delmastro, 2002). The average number of employers of tenants is only marginally higher in NTBIs than it is in TIs and the differences are not statistically significant. This is caused by the lower growth of NTBIs' tenants as shown by the average entry age and average current age. NTBIs' tenants do not show any significant growth between entering the BIs and the moment of research.

3.5.1 Limitations and Further Research

Our study is not without limitations. We acknowledge that we worked with a small sample of BIs and a low tenant response rate per surveyed BI. This is a constraint we share with the overwhelming majority of studies in incubation. Scarcity of data (e.g. Salvador, 2010; Zhang, 2009), data collected on a project basis (e.g. Carayannis & von Zedtwitz, 2005; von Zedtwitz & Grimaldi, 2006) or case studies (Patton, Warren, & Bream, 2009) are the commonly used methods in BI research. We tried to ameliorate the small sample problem by shifting the level of analysis

from BI to types of BIs and therefore grouped our BIs and their respective tenants in only two categories. Thus, we believe our results are a contribution towards the better understanding of TIs and NTBIs and the underlying business support mechanisms.

We identify two main avenues for further research. First, future studies should investigate in more detail the evolution of BIs by collecting longitudinal data. Our findings suggested that the profit-seeking behaviour from NTBIs might lead to relaxing selection criteria and the non enforcement of exit policies which, in their turn, create a tenant population with almost no company using incubation services. However, given that all NTBIs are systematically older than TIs (Table 3.2), we could not understand if these management practices are established since each NTBI's inception or emerge later. BIs share with venture capitalists (VC) the objective of helping young companies to grow and survive. VCs are known to be profit-seeking while at the same time they contribute actively to professionalize the companies and the entrepreneurs in their portfolios (M. Gorman & Sahlman, 1989; Hellmann & Puri, 2002). This raises the question of what other factors beyond the profit-oriented nature of NTBIs contribute to their weak selection criteria and loose exit policies. The answer might lie in their evolution path or other strategy shifts.

Second, future research should concentrate more on collecting data from incubated companies. Our study is among the few in recent years attempting to uncover important BIs' characteristics by collecting data from sources that go beyond from other sources than the incubation management (e.g. C. Cooper, Hamel, & Connaughton, 2010; Lee & Osteryoung, 2004; McAdam & McAdam, 2008; e.g. Mian, 1997; Patton, Warren, & Bream, 2009; Rice, 2002; Schwartz, 2009). Incubated companies constitutes the best evidence and data source to address questions about every level of BI research such as BI effectiveness, BI impact on tenant companies or drivers for successful business support (cf. Hackett & Dilts, 2004).

3.6 Conclusions and Implications

The distinction between TIs and NTBIs can be seen in their service provision levels and traced back to their selection criteria and exit policy. Our results show that TIs provide a bigger proportion of their tenants with any of the services and suggest that this is consequence of their strict selection criteria and enforced exit policy. This means that TIs have a role in facilitating the creation and contributing to the survival of new technology based ventures. Against this backdrop, it can be argued that TIs constitute a valuable tool for universities or regions seeking to rejuvenate their economic fabric (Colombo, Mustar, & Wright, 2010).

We contribute to the body of knowledge on BI mainly in two ways. First, we add to the several BIs typology studies (e.g. von Zedtwitz & Grimaldi, 2006) suggesting that profit-seeking behaviour of NTBIs and their different service portfolio is mediated by their selection criteria and exit policy. This means that there is not necessarily an imprinting effect of the profit vs non-profit behaviour that determines the service portfolio of BIs. Rather, the relaxed selection criteria and exit policy lead to a tenant population which does not require certain services. As a result, the low levels of service usage might drive the BI management to suspend service provision or seek alternative ways of providing services. Second, we provide tentative evidence that some kinds of BIs might be more effective in contributing to future tenant companies' performance than others. Recently, Amezcua (2010, p. 33) showed that BIs reduce the lifespan of incubated companies while contributing to increase their growth in terms of employment and sales. Our results suggest that this effect might not be the same across types of BIs. For instance, NTBIs provide much less of their tenants with support services but at the same time house them for a much longer period of time. This might artificially keep companies alive or at least postpone their valley of death phase (Schwartz, 2009). It is a promising topic of research to find out which kind of BIs in fact help companies grow and which kind ensures a longer lifespan.

Our results have implications for BI managers, prospective tenants and policy makers. BI management should take in account the impact of selection criteria and exit policy on the population of tenants as well as on the consequent levels of business services provision. Well defined selection criteria and strong exit policies determine the share of companies willing and needing to enjoy every dimension of business incubation beyond infrastructure. If the tenant population is older and heterogeneous, then certain business services are less needed or not needed at all. This suggests different strategies for providing a certain service. For instance, BI management might look for alternative sources of business support services to provide the few tenants who still need them to some extent (outsourcing instead of in-house expertise, service level agreements, among others). Prospective tenants also gained an improved understanding on the profile of BIs to look for, according to their stage of development and need for business support services. Not all firms will need a TI environment to develop. Established companies in need of mostly infrastructure services are better off looking for a NTBI to base their operations. Finally, policy makers can also better design BIs and their features according to specific policy aims. When economic rejuvenation through the creation of science based new companies is the aim, TIs are potentially an adequate tool. Conversely, if there is a need to concentrate small mature companies in one location, then NTBIs can be the right tool. In both cases, the objective of supporting young companies is achieved.

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Chapter 4

Business Support Within Business Incubators

This chapter is based on:

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Abstract

Business incubators (BI) have been established worldwide as tools for company creation and small businesses support. BIs claim to help their tenants by providing them with the optimal conditions for increasing early stage survival and long term performance. Practitioners and researchers agree that business support is a crucial feature of incubating businesses. Yet this is seldom researched. In this study we theoretically relate business support to help in solving problems and further investigate to what extent business incubators support their tenants overcome their developmental problems. Results show that tenants do not experience many problems and when they do business support is not necessarily sought. Furthermore, our data suggests that business support is not preferentially sought within incubator environment. When this happens, support provided by the BI does not contribute to problem solving. Finally, we discuss the impact of the type of BI in helping their tenants.

Keywords: Business Incubators, Business Incubation, Business Support, Problem Solving

4.1 Introduction

Business incubators (BI) are a unique combination of people, space and business development processes (UKBI, 2007). The ultimate goal of business incubators is to support nascent companies and entrepreneurs till they become sustainable businesses (Lalkaka & Bishop, 1996), contributing to job and wealth creation (EC, 2002; NBIA, 2007). Usually property-based (Phan, Siegel, & Wright, 2005), BIs provide their clients with specialized services such as flexible space, shared equipment, administrative services, granting them networking opportunities and access to venture capital (EC, 2002; Hackett & Dilts, 2004; Lalkaka & Bishop, 1996). However, little is known about the impact of BI on tenants companies as there is no systematic framework to understand and identify the nature of their performance (Hackett & Dilts, 2004; Phan, Siegel, & Wright, 2005).

Business support services are part of BIs (Chan & Lau, 2005; Grimaldi & Grandi, 2005; Merrifield, 1987) and perhaps their most important dimension (Bergek & Norrman, 2008). Yet Peña (2004) found that general incubator services do not significantly explain that growth of incubated firms. Outside the incubator's context, the relationship between external business advice and small firm growth has already been researched (Robson & Bennett, 2000) as well as the role of an external support agency in new firm growth (Davidsson & Honig, 2003); both were found to have no impact. However, these studies did not use a comprehensive framework for business support, enquiring only about their existence.

Our main research proposition is: "Are BIs contributing to tenants' development?" In this study, we investigate the specific contribution of business support provided by BIs using a 20 problem framework. Business support is studied in the form of problem solving. The basis for defining the problems framework was inspired by the work of Parsons on social systems (1964) and its more recent theoretical developments applied to entrepreneurial ventures (Groen, Wakkee, & De Weerd-Nederhof, 2008). Our analysis will show whether business support within the BI impacts problem solving. To empirically test our framework, we researched 354

incubated companies across 12 BIs located in Northwestern Europe. Results will show where companies housed within a BI are more likely to seek support as well as in which specific problems that is more likely to happen.

4.2 The Nature of Business Incubation

We start by analyzing literature on BIs, searching for a definition while exploring the evolution of the concept since its emergence in the 1970s. Next, we describe briefly which business support services are more often provided to tenants. Finally, we present the operationalization of business support in the form of problems experienced, support sought and solution achieved.

4.2.1 Evolution of business incubation

BIs have been evolving since the 1970s, when they initially emerged among other small and medium enterprise support initiatives. The first generation of BI offered mainly low-cost space and shared resources to entrepreneurs (Barrow, 2001; Lalkaka & Bishop, 1996). In the beginning of the 1980s, partly due to the unemployment rampage arising from traditional sectors, policy makers started to establish BI as tools for economic development as well as promoters of regional revitalization (Lewis, 2001). This second generation of BIs already included more developed services such as management training as well as access to finance (Lalkaka & Bishop, 1996). Today's BIs - the third generation - are collaborative service providers, offering a broad portfolio of business support services, such as consultancy, networking and access to venture capital (EC, 2002; Lalkaka & Bishop, 1996).

There are no universally accepted definitions for BIs. Looking at several definitions proposed in both academic and practitioner literature, it transpires that definitions do not focus exclusively on physical space, but also include the provision of services as well as access to professional networks. Business support services generally include physical premises for incubated firms as the key defining feature

(Table 4.1). Yet BIs are much more than providing a key-in-hand office and shared building services (Aernoudt, 2004). Literature suggests business incubation to have additional dimensions such as shared resources, business support and access to networks (e.g. Barrow, 2001; Smilor & Gill, 1986). Practitioners often claim that BI have several multi-level impacts, such as firm performance and long-term survival, economic growth, job creation as well as active contribution to an entrepreneurial culture (EC, 2002; NBIA, 2007; OECD, 1997; UKBI, 2007) (Table 4.1).

The population of BI is far from being homogenous. Several models have been proposed based on characteristics such as ownership (Carayannis & von Zedtwitz, 2005; Grimaldi & Grandi, 2005), management characteristics (Aerts, Matthyssens, & Vandenbempt, 2007; Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005), strategic objectives (Hackett & Dilts, 2004; Koh, Koh, & Tschang, 2005; Schwartz & Hornych, 2008; von Zedtwitz & Grimaldi, 2006), competitive focus (Carayannis & von Zedtwitz, 2005; von Zedtwitz & Grimaldi, 2006) and available services (Grimaldi & Grandi, 2005; Hansson, Husted, & Vestergaard, 2005). According to the National Business Incubation Association, the most common type of BIs in the USA are mixed use (54%) and technology based (39%) (Knopp, 2007). Also, Aernoudt (2004) lists these types of business incubation among the most important. Mixed use BIs do not show any focus in terms of sector of activity of incubated companies and aim mainly at employment creation. Conversely, technology based BIs are often focused in terms of sector of activity of incubated companies and aim mainly at bridging an entrepreneurial gap and address market failures (Aernoudt, 2004).

4.2.2 Dimensions of business incubation

Business incubation operates along three dimensions: infrastructure, business support and access to networks (e.g. Barrow, 2001; Smilor & Gill, 1986). Therefore, business incubation services include all services provided to tenants which cover these dimensions.

Table 4.1 – Definitions of Business Incubation

National Business Incubation Association. Business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services. These services are usually developed or orchestrated by incubator management and offered both in the business incubator and through its network of contacts. A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding. These incubator graduates have the potential to create jobs, revitalize neighbourhoods, commercialize new technologies, and strengthen local and national economies (NBIA, 2007).
United Kingdom Business Incubation. Business Incubation is a unique and highly flexible combination of business development processes, infrastructure and people, designed to nurture and grow new and small businesses by supporting them through the early stages of development and change(UKBI, 2007) .
United Nation Development Programme. (…) incubators exist to support the transformation of selected, early-stage business with high potential, into self-sufficient, growing, and profitable enterprises. By reducing the risks during the early period of business formation, the incubator is intended to contribute to economic growth through sustaining enterprises that otherwise fail due to a lack of adequate support; creating present and future jobs, and other socio-economic benefits (Lalkaka & Bishop, 1996).
European Commision. A business incubator is an organisation that accelerates and systematises the process of creating successful enterprises by providing them with a comprehensive and integrated range of support, including: Incubator space, business support services, and clustering and networking opportunities. By providing their clients with services on a 'one-stop-shop' basis and enabling overheads to be reduced by sharing costs, business incubators significantly improve the survival and growth prospects of new start-ups. A successful business incubator will generate a steady flow of new businesses with above average job and wealth creation potential. Differences in stakeholder objectives for incubators, admission and exit criteria, the knowledge intensity of projects, and the precise configuration of facilities and services, will distinguish one type of business incubator from another (EC, 2002).
Organisation for Economic Co-operation and Development. Technology incubators are a specific type of business incubator: property-based ventures which provide a range of services to entrepreneurs and start-ups, including physical infrastructure (office space, laboratories), management support (business planning, training, marketing), technical support (researchers, data bases), access to financing (venture capital funds, business angel networks), legal assistance (licensing, intellectual property) and networking (with other incubators and government services) (OECD, 1997).

Infrastructure

Infrastructure consists of space and shared resources. Providing space has always been part of BI (Lalkaka & Bishop, 1996). Available premises are generally an office although some BI show different approaches such as hot-desking (more common in pre-incubation schemes) (Barrow, 2001). Provision of space is critical to business incubation (Bergek & Norrman, 2008; Lee & Osteryoung, 2004; McAdam & McAdam, 2008) and empirical evidence suggests it as the most beneficial feature to tenants (Chan & Lau, 2005). Additionally, the office space already includes some services which can be classified as shared resources. These include reception, secretariat, meeting rooms, conference rooms or car parking (Aerts, Matthyssens, & Vandenbempt, 2007; EC, 2002; McAdam & McAdam, 2008). More specialized premises, such as laboratories and research equipment, can also be placed under shared resources (Grimaldi & Grandi, 2005).

Business support services

Professional business services emerged in the second generation of BIs and are integral part of the third generation (Lalkaka & Abetti, 1999; Lalkaka & Bishop, 1996). These include mentoring, coaching and counselling (Chan & Lau, 2005; EC, 2002), business plan development support (Peña, 2004) and training (Aerts, Matthyssens, & Vandenbempt, 2007; Barrow, 2001). Some BIs were found to provide directly or indirectly seed and venture capital (Bøllingtoft & Ulhøi, 2005; Sofouli & Vonortas, 2007). Recently, the concept of virtual business support emerged alongside the use of web-based technologies (Carayannis & von Zedtwitz, 2005; Durão, Sarmento, Varela, & Maltez, 2005; Nowak & Grantham, 2000).

Access to networks

Access to a network of professional contacts is also part of the incubator concept (Hansen, Chesbrough, Nohria, & Sull, 2000). Some authors actually define BIs as networks of individuals and organizations (Hackett & Dilts, 2004, p. 57). Also, networking both among tenants, and graduates and tenants is reported in some empirical studies as crucial (Aernoudt, 2004; Grimaldi & Grandi, 2005). Linking

tenants to the most appropriate networks will ultimately help them to build their social capital (Bøllingtoft & Ulhøi, 2005; Totterman & Sten, 2005). The value of social capital for new ventures is already ascertained (Davidsson & Honig, 2003), found critical among incubated companies (McAdam & McAdam, 2008) and crucial in the development of high-tech spin out companies (Vohora, Wright, & Lockett, 2004).

4.3 The problem-solution framework

We developed a framework for analyzing business support within BI. The key assumption here is that tenants experience problems throughout their development and the best way BI can provide support is by helping them to overcome such problems. This premise is also used by Nickerson and Zenger (Nickerson & Zenger, 2004) according to which companies develop their capabilities through learning processes (Zollo & Winter, 2002) triggered by searching for solution to problems encountered. The list of problems was inspired by the work of Parsons (1964) using also more recent insights applied to entrepreneurship (Groen, Wakkee, & De Weerd-Nederhof, 2008). Furthermore, we considered empirical literature on business incubation (e.g. McAdam & McAdam, 2008), business support (e.g. Robson & Bennett, 2000) and new venture development (e.g. Vohora, Wright, & Lockett, 2004).

According to Groen et al.'s four capital theory (2008) entrepreneurs will develop along four main dimensions: strategic, cultural, economic and social. In each one it is therefore necessary that entrepreneurs possess a certain minimum capital threshold to evolve (Groen, Wakkee, & De Weerd-Nederhof, 2008). Strategic Capital encompasses the strategy of the firm's and also its position and authority in the field (Kirwan, van der Sijde, & Groen, 2007). In a broader sense, strategic capital is defined by set of capacities that enables actors to decide on goals and to control resources and other actors to attain them (Groen, Wakkee, & De Weerd-Nederhof, 2008; Kirwan, van der Sijde, & Groen, 2007). Increase the firm's credibility will be the key problem to increase this kind of capital (McAdam &

McAdam, 2008; Vohora, Wright, & Lockett, 2004). For new ventures, writing a business plan is also particularly important (Delmar & Shane, 2003). Furthermore, to introduce new products, accelerate their time-to-market and generating new business ideas are also part of the firm's strategy. Finally, get advantage over competitors is also part of this kind of capital (cf. Covin & Slevin, 1991). Economic capital is traditionally linked to financial resources. This capital is a set of mobile resources used in the relationships between the firm and its environment, mainly in processes of acquisition, disposal or selling (Groen, Wakkee, & De Weerd-Nederhof, 2008). Obtaining finance is a key problem most new ventures face (Bryson, Keeble, & Wood, 1997; Honjo & Harada, 2006; Vohora, Wright, & Lockett, 2004). Further problems in this kind of capital are: i) save on equipment costs; ii) improve cash flow; and iii) save on labor costs (Table 4.2).

Cultural Capital comprises the firm's and the entrepreneurs' knowledge and experience (Kirwan, van der Sijde, & Groen, 2007) as well as the valid set of values, norms, beliefs, assumptions, symbols, rule sets, behaviours and artefacts (Groen, Wakkee, & De Weerd-Nederhof, 2008). Hence, in order to increase this kind of capital, the venture will need to professionalize its management and hire qualified personnel to enhance their entrepreneurial skills. The premise that management skills may hinder firm's growth is known as Penrosian effect (Penrose, 1959; Thompson & Wright, 2005). Also, Richardson (1964) and Shen (1970) investigated the availability of managerial talent as a determinant of firm's growth. External advice can also be a source of cultural capital. The impact of external advice in firm's performance has already been investigated (Robson & Bennett, 2000). We also added compliance with administrative regulations as well as introducing new technologies as problems that can arise when trying to increase the firm's cultural capital. As some firms might be about to leave the incubator or in need or production space, we included finding suitable office space in cultural capital.

Table 4.2 – List of problems organized according to Groen et al.'s four capital model (2008)

Capital	**Problem (derived from Groen, Wakkee, & De Weerd-Nederhof, 2008; cf. Parsons, 1964)**
Strategic	Accelerate Time-to-Market
	Get advantage over competitors
	Introduce new products
	Increase credibility
	Write/Present BP
	Generate new business ideas
Economic	Obtain finance
	Save equipment costs
	Improve cash flow
	Save on labor costs
Cultural	Professionalize management
	Hire personnel
	Comply administrative regulations
	Get external advice
	Enhance entrepreneurial skills
	Introduce new technology
	Find office/production space
Social	Build/expand market base
	Ally with enterprises
	Establish suppliers contacts

Lastly, *Social Capital* is related to the actors in the firm's network through which it can acquire other kinds of capital (Coleman, 1988; Groen, Wakkee, & De Weerd-Nederhof, 2008; Portes, 1998). Problems to develop this kind of capital relate to alliances (Gomes- Casseres, 1997; Larson, 1991; suggested by Peña, 2004 in the incubation context; Wright, Vohora, & Lockett, 2004), establish supplier contacts and market base expansion.

4.4 Building hypotheses

Our main research proposition is: "Are business incubators contributing to tenants' development?". Young ventures experience problems throughout their development (e.g. Groen, Wakkee, & De Weerd-Nederhof, 2008; Vohora, Wright, & Lockett, 2004). Our chief assumption here is that young ventures housed within a BI will have privileged access to business support for those specific problems. In other words, the BI support will have a determinant role in solving problems. It is crucial to consider also the effect of problems experienced: tenants would not seek support if they would not experience any problem (Figure 4.1).

> *H1: The total amount of problems solved is related to the total amount of problems experienced controlling for the total of amount of support given by the incubator.*

However, companies located within incubators do not necessarily enjoy business support provided only by the incubation management. Support provided directly outside can also exist. This means that companies might solve their problems without the specific help of the incubator but rather with help of any support sought.

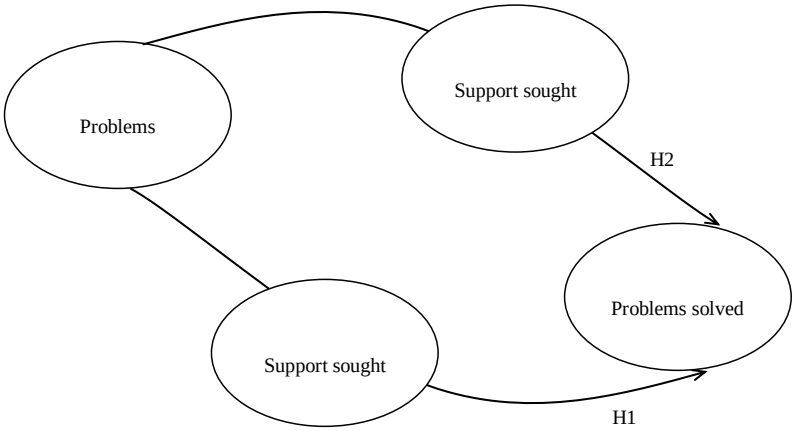
> *H2: The total amount of problems solved is related to the total amount of problems experienced controlling for the total of amount of any support.*

We will also analyze both hypotheses for each problem to investigate whether differences between problems exist.

4.5 Research design

To investigate to what extent BIs are helping their tenants to solve problems, we sent out written questionnaires to a 354 incubated companies housed at each of the selected 12 BIs at the time of research.

Figure 4.1– Schematic representation of the research model



4.5.1 The business incubation centres

The BIs were part of the Nensi project - North European Network of Services Incubators. The Nensi incubators were a self-selected network of BIs and EU funded for a total of 3 years. Located across five European countries (France, Germany, Ireland, the Netherlands and the United Kingdom), the 12 BIs share most of their basic characteristics: they are owned by a combination of universities and regional authorities and mostly located in urban regions or within cities. Furthermore, no specific focus in terms of sectors of activity or nature of their tenants was found. All the BIs offer approximately the same bundle of business support services, i.e., space, facility support, counselling, business plan development, training, brokerage, access to seed and venture capital and virtual support (one of the deliverables of the project). Finally, tenants are already established companies and trading; average tenant entry age is about 2 years and age the time of research was above 4 years (Table 4.3).

4.5.2 Data collection and methods

During the Nensi project, we collected data from supply (incubators) and demand (tenants), using two questionnaires (one for the initial moment and other for the periodic follow-up). However, for this initial analysis, we only focus on a small part of the database related to problem experienced, support sought and problem solution (for a detailed description of both questionnaires and the monitoring tool see Jenniskens, 2006). From the initial call to 354 companies, 164 answered (46%). However, while conducting the second monitoring exercise only 101 returned questionnaires (29%). The problem solution approach was only asked in the follow up questionnaire and referred to problem support since entrance in the incubator.

For each of the problems described above (Table 4.2), we enquired on their seriousness using a five point scale. Subsequently, we enquired if support was sought and where using the following three options: incubation management, fellow tenants or directly outside. Finally, we asked whether the problem was solved.

Table 4.3 - General characteristics and data availability of the researched business incubators

Country	Incubator	Location	Focus	# companies	# companies 1st questionnaire		# companies 2nd questionnaire		Entry age	Age
Netherlands	BTC	Campus / Business and Science Park	Mixed use	68	13	19%	11	16%	1.73	6.45
	Campus Business Centre	Urban	Mixed use	49	27	55%	18	37%	1.94 (N=16)	3.38 (N=16)
	ROC ASA	Campus	Mixed use	10	6	60%	4	40%	8.25	9.25
UK	CUTP - EPIC - Eliot Park Innovation Centre	Urban	Mixed use	17	15	88%	2	12%	3.50	4.50
	EMIN - Innovation Centre	Campus	Technology based	18	11	61%	6	33%	-	3.83
	EMIN - Sparkhouse Studios	Campus	Technology based	10	10	100%	6	60%	-	1.17
Ireland	DCEB - Guinness Enterprise Centre	City	Mixed use	67	9	13%	7	10%	5.29	8.43
	DCEB - iCELT	Campus	Technology based	13	7	54%	3	23%	7.00	9.67
	DCEB - Terenure Enterprise Board	City	Mixed use	25	10	40%	6	24%	0.83	2.83
France	Emergence	Urban	Technology based Focused on young ventures	16	16	100%	13	81%	0.58 (N=12)	2.5 (N=12)
	Normandie Incubation	Campus	Technology based Focused on pre starters	19	17	89%	14	74%	-0.45 (N=11)	1.55 (N=11)
Germany	TechnologiePark Münster	Urban	Technology based	42	23	55%	11	26%	2.00 (N=10)	6.09 (N=11)
Total				354	164	46%	101	29%	2.13 (N=82)	4.42 (N=95)

4.6 Results

To test our hypotheses, we used partial correlations analysis. Looking at partial correlations of problems solved, problems experienced and support sought (either generally or specifically in the incubator) will allow us to investigate what proportion of support sought explains problems solved (Cohen, Cohen, West, & Aiken, 2003). The incubation hypothesis (H1) will meet the conditions

$$\begin{cases} r_{PS,SuppInc} < r_{PS,Supp} < r_{PS} \\ r_{PS,SuppInc} \approx 0 \end{cases} \quad (1)$$

where *P* is the total amount of problems solved, *S* the amount of problems solved, *SuppInc* the total amount of problems for which support was sought within the incubator and *r* are the partial correlations.

In the first condition we require that the partial correlation controlling for is smaller than the partial correlation controlling for business support sought anywhere and both are smaller that the zero order correlation. Partial correlations have to be smaller than zero order correlations. If this is not the case, then spurious relationships and different causal relationships between the variables are present (Cohen, Cohen, West, & Aiken, 2003). The farther the partial correlation is from the zero order correlation, the bigger the effect of control is (Cohen, Cohen, West, & Aiken, 2003). Hence, if $r_{PS,SuppInc}$ is smaller than $r_{PS,Supp}$, it follows that the support sought within the incubator explains a bigger proportion of problems solved. The second condition requires that the partial correlation controlling for business support sought within the incubator is close to zero. If $r_{PS,SuppInc} \approx 0$ it follows that problems solved could not be correlated to problems experienced without the presence of business support (Cohen, Cohen, West, & Aiken, 2003).

Similarly, the non-incubator hypothesis will meet the conditions

$$\begin{cases} r_{PS,Supp} < r_{PS} \\ r_{PS,Supp} \approx 0 \end{cases} \quad (2)$$

The same conditions are valid when analyzing individual problems.

4.6.1 Descriptive statistics

Table 4.4 shows the descriptive statistics on problems, support and solutions. The first column represents the percentage of tenants who experienced a given problem in any degree of seriousness. The second column relaxes the construct by considering the first two points of the five point scale as no problem occurring. The remainder columns represent the percentage of tenants who sought support within the incubator, who sought support anywhere, and who solved their problems, respectively.

These results show that while large percentages of tenants experience problems, their seriousness is not so high. The most frequent problems and most serious problems are mainly strategic and relate to introducing new products (63.4%), accelerate time to market (64.4%) and get advantage over competitors (69.3%). Expanding market base (80.2%), improving cash flow (62.4%), professionalize management (65.3%) and hire personnel (54.5%) are also among the most frequent and most serious problems.

However, apart from building market base, the most frequent and serious problems are not among the one for which support is sought for. Tenants mainly seek support in cultural and social issues such alliances (33.7%), external advice (47.5%) and comply with regulation (30.7%). Also, support on obtaining finance is highly sought for (42.6%). Yet support within the incubator management is sought for strategic and cultural issues such as increase credibility (14.9%), write and present a business plan (15.8%) and get external advice (29.7%).

Table 4.4 – Descriptive statistics on problems, support and solutions

Capital	Problem	Problem experienced (%)	Serious problem experienced (%)	Support within Incubator (%)	Support anywhere (%)	Problem solved (%)
Strategic	Accelerate Time-to-Market	64.4	50.5	7.9	20.8	19.8
	Get advantage over competitors	69.3	43.6	5.9	27.7	46.5
	Introduce new products	63.4	40.6	7.9	27.7	45.5
	Increase credibility	47.5	29.7	14.9	26.7	47.5
	Write/Present BP	48.5	27.7	15.8	26.7	35.6
	Generate new business ideas	47.5	21.8	7.9	17.8	50.5
Economic	Obtain finance	40.6	29.7	24.8	42.6	33.7
	Save equipment costs	43.6	22.8	2.0	11.9	15.8
	Improve cash flow	62.4	43.6	8.9	21.8	32.7
	Save on labor costs	55.4	35.6	5.0	16.8	13.9
Cultural	Professionalize management	65.3	33.7	7.9	19.8	33.7
	Hire personnel	54.5	36.6	6.9	25.7	32.7
	Comply administrative regulations	46.5	33.7	11.9	30.7	31.7
	Get external advice	43.6	24.8	29.7	47.5	45.5
	Enhance entrepreneurial skills	53.5	30.7	11.9	20.8	35.6
	Introduce new technology	51.5	28.7	7.9	18.8	25.7
	Find office/production space	30.7	18.8	3.0	26.7	29.7
Social	Build/expand market base	80.2	53.5	8.9	38.6	47.5
	Ally with enterprises	48.5	21.8	6.9	33.7	49.5
	Establish suppliers contacts	38.6	17.8	1.0	18.8	40.6

N=101

4.6.2 Hypotheses testing

Aggregated results show no support for any hypothesis (Table 4.5). Aggregated partial correlation between problems experienced and problems solved mediated by incubator support is not low enough to satisfy the condition (1). Similarly, aggregated partial correlation between problems experienced and problems solved mediated by support sought anywhere is not low enough to satisfy the condition (2).

Table 4.5 – Zero order and partial correlations (aggregated values)

Variables	Control Variables: Total number for which support was sought	Partial correlation	Zero-Order Correlation
Total number of experienced problems	Anywhere	0,292**	
Total problems solved	within the incubator management	0,285**	0,453***
	next to fellow tenants	0,442***	
	directly outside	0,317**	

N=95

Conversely, the results show that support sought within fellow incubated companies does not mediate solving problems. Aggregated partial correlation between problems experienced and problems solved mediated by incubator support is not low enough to satisfy the condition (1).

Results for each problem are shown in Table 4.6. Some moderation effects were observed: support given by the incubator management is partially responsible for solving problems for introducing new products and writing the business plan. On the other hand, this is not true for improving cash flow, save on labour costs and

introduce new technologies. In this case we found that support provided by the BI was partially helping tenants to solve problems but to a lesser extent than support provided anywhere. This confirms condition (2) for those problems.

Table 4.6 – Zero order and partial correlations (per problem)

Capital	Variables: Problem and Solution	Control Variables: Support sought	Partial correlation	Zero-Order Correlation
Strategic	Accelerate Time-to-Market	Anywhere	0.024	0.136
		within the incubator management	0.094	
	Get advantage over competitors	Anywhere	0.067	0.171
		within the incubator management	0.125	
	Introduce new products	Anywhere	0.181	0.265*
		within the incubator management	0.248*	
	Increase credibility	Anywhere	0.128	0.190
		within the incubator management	0.135	
	Write and Present Business Plan	Anywhere	0.091	0.274**
		within the incubator management	0.217*	
	Generate new business ideas	Anywhere	-0.016	0.118
		within the incubator management	0.122	
Economic	Obtain finance	Anywhere	0.100	0.368***
		within the incubator management	0.089	
	Save equipment costs	anywhere	0.168	0.241*
		within the incubator management	0.121	
	Improve cash flow	anywhere	0.231*	0.311**
		within the incubator management	0.298**	
	Save on labor costs	anywhere	0.242*	0.369***
		within the incubator management	0.365***	

]

Table 4.6 (cont.) – Zero order and partial correlations (per problem)

Capital	Variables: Problem and Solution	Control Variables: Support sought	Partial correlation	Zero-Order Correlation
Cultural	Professionalize management	anywhere	0.079	0.114
		within the incubator management	0.116	
	Hire personnel	anywhere	0.094	0.259*
		within the incubator management	0.224*	
	Comply with administrative regulations	anywhere	0.054	0.163
		within the incubator management	0.134	
	Get external advice	anywhere	0.007	0.208*
		within the incubator management	0.078	
	Enhance entrepreneurial skills	anywhere	0.039	0.187*
		within the incubator management	0.119	
	Introduce new technology	anywhere	0.273*	0.404***
		within the incubator management	0.411***	
	Find office/production space	anywhere	0.050	0.184
		within the incubator management	0.160	
Social	Build/expand market base	anywhere	0.033	0.040
		within the incubator management	0.033	
	Ally with enterprises	Anywhere	0.195	0.231*
		within the incubator management	0.207	
		directly outside		
	Establish suppliers contacts	Anywhere	0.111	0.176
		within the incubator management	0.111	

N=95

Table 4.7 - Zero order and partial correlations (aggregated values) for mixed use and technology based incubators

Variables		Control Variables: Total number for which support was sought	Partial correlation	Zero-Order Correlation
Mixed use Incubators (N=45)	Total number of experienced problems Total problems solved	anywhere	0.272	0.266
		Within the incubator management	0.268	
		next to fellow tenants	0.254	
		directly outside	0.217	
Technology based incubator (N=48)	Total number of experienced problems Total problems solved	anywhere	0.374**	0.505***
		Within the incubator management	0.374**	
		next to fellow tenants	0.547***	
		directly outside	0.446***	

Our population of BIs is not homogeneous (Table 4.3). We also tested hypothesis 1 and 2 grouping our cases by type of BI: mixed-use vs technology based. Results show moderate support for hypothesis 1 only for technology based incubators (Table 4.7). This means that tenants housed within technology based BIs who seek support within the incubator management are more likely to solve their problem than those seeking support directly outside.

4.7 Discussion and Conclusion

We set out to investigate to what extent BIs help their tenants to develop. Our chief assumption is that tenants experience problems during their development and business incubation comes in the form of help to overcome such problems. Results show that incubators are not intensively helping their tenants even though they (the tenants) experience frequent and serious problems. Tenants experience only about half of the problems we inquired about. Support for solving those problems is not necessarily sought and it is even less likely to be sought within the incubator. Yet differences across the type of problems for which support is sought are visible: while strategic problems are among the most frequent and serious problems tenant

face, incubator support is mostly likely sought in human capital development areas. This suggests that tenants' perspective about their problems and their actual needs are not the same. It might also imply a mismatch between the support currently provided by BI and the needs of tenants: while BIs are helping tenants in developing their human capital, their most immediate needs are strategic. This type of mismatch is potentially serious in what regards to solving tenants' development problems. At the same time, it impacts the effectiveness of the BI outcomes as it provides new venture with different skills than those needed.

We hypothesized the relationship between problems experienced and problems solved to be moderated by support sought within the incubator environment. Zero order correlations between experiencing and solving problems are generally low. This means that tenants who experienced problems did not solve them, regardless of help sought. Partial correlations show that having support whether inside or outside the BI does not help explaining the problem solution. Also, differences between seeking support anywhere, within the BI or directly outside are not significant.

The analysis per problem shows that two strategic problems (introduce new products, write and present a business plan), two economic problems (improve cash flow, save on labour costs) and one cultural problem (hire personnel) are being partially solved with the BI's support. While we could not satisfy any of the condition (1), condition (2) is satisfied indicating that on the problem level support anywhere but not specifically from the BI is partially explaining problems solved. The lack of significance in most problems suggests that solving those problems is unrelated to support delivered and, surprisingly, not related to experiencing problems. If solving problems is not correlated to seeking support it means that either problems are not being solved or that solutions are dependent of other unobserved variables. We speculate that this is a result of tenant firms solving problems on their own, that is, without seeking support. Our research design also allows for tenants to declare problems solved that were not necessarily declared as experienced. In this case, this lack of significance in the individual problem analysis

might emerge from the fact that tenants remember solution for problems they were previously unaware of.

Condition (2) was confirmed for some specific problems. As hypothesised, this means that the BI is not necessarily helping solving those problems. Again, we speculate that this might be the results of a mismatch of lack of capabilities to help tenant solving those problems. Tenants are, in this case, seeking support somewhere else than the BI and receiving it effectively.

Finally, we found that the type of BI impacts the value of support given to tenants. Support within technology based BIs helps explaining problem solving while within mixed use BIs no significant correlation was found. The reason might lie in some of the differentiating characteristics of mixed use BIs.

Our results contribute to the current discussion about the impacts of business incubation (e.g. Hackett & Dilts, 2004; Phan, Siegel, & Wright, 2005) by investigating the current state of business support within business incubators. Our analysis challenges the often accepted view that incubators provide their tenants with a comprehensive, unique and constant package of services. The results can be used to differentiate business incubators based on their ability to help tenants to solve problems.

We highlight two future avenues for research. Firstly, investigate the reason behind tenants not looking for support. This suggests that tenants are solving their problems without any help. This *independence hypothesis* is potentially related to tenants' experience or company age. Secondly, further analysis of the defining characteristics of each type of incubator and its relationship to business support patters is needed. For instance,, technology based incubators might have a more proactive way of providing support while mixed use incubators deliver on demand.

This study is not without its limitations. We compared support sought for problems to the specific support sought within the BI management. These categories are not mutually exclusive. Further analysis should compare directly the business support provided by the BI and business support sought directly outside. Also, we did not

focus in any characteristics of each BI, except mixed use BIs and technology based BIs. Further analysis will investigate which BI differences impact business support.

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Chapter 5

The role of Business Iincubators in Facilitating Firm Development

This chapter is based on:

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Abstract

Business incubators (BI) are among a variety of initiatives to stimulate economic growth by promoting the creation and development of new companies. The rapid growth of BIs in recent years confirms their importance in the economic fabric. In this study, we conceptualize BIs using insights from the knowledge based theory of the firm, resource-based view thinking and capabilities literature. BIs are seen as service providers geared towards helping their tenants in solving developmental problems. The more problems the BI helps to solve the bigger is incubation value for tenants; further, as tenant firms solve problems they develop important capabilities which will increase their chances of survival in the long term. We surveyed 73 tenant companies located in 12 BIs in Northwestern Europe about their experienced problems, support sought and problems solved. Results show that tenants unequivocally seek support after experiencing problems. Solving those problems is a function of BI support and other external sources part of each tenant firm's network of contacts. Age and human capital of tenant firms have a negative impact in the total number of the problems solved, suggesting BIs' deficiencies in helping more experienced and older tenants. Our main contribution is to shed light on the process of delivering support to young firms within BIs. Importantly, we assess the value of the BIs' intervention by measuring the amount of developmental problems they help tenants to overcome. Finally, we discuss the implication of our findings to BI managers, prospective tenants and policy makers.

Keywords: Business Incubation, Business Support, Capabilities development, Problem Solving, Entrepreneurship.

5.1 Introduction

Business incubators (BI) position themselves at the core of business support initiatives. BIs set out to nurture nascent companies, providing them with the support needed to maximize their chances of survival. Since the first BI in United States in the late 1950s (Adkins, 2002), the concept of incubation evolved. Rather than having their offer based on infrastructure, BIs have become collaborative service providers (Lalkaka & Bishop, 1996). Yet academic research has been unable to uncover acceptably the impact of BI in creating job and wealth (Massey, Quintas, & Wield, 1992; Quintas, Wield, & Massey, 1992), facilitating university-industry interaction (Rothaermel & Thursby, 2005a, 2005b), increasing innovation activity (Colombo & Delmastro, 2002), or promoting firm performance. Several reasons might be behind this. First, the plethora of models, different stakeholders and a variety of management practices existent in the universe of BIs, all taken together, provide an extra difficulty to investigate the nature of their performance (Phan, Siegel, & Wright, 2005). Second, the lack of an appropriate theoretical background does not allow researchers to adequately analyze the BI's intervention (Hackett & Dilts, 2004).

We build on insights from the knowledge based theory of the firm (Grant, 1996; Hsieh, Nickerson, & Zenger, 2007; Nickerson & Zenger, 2004) to provide a theoretical ground to BIs. Nickerson and Zenger (2004) conceptualize solving problems as the basic mechanism to create capabilities within a firm. Managers, when faced with a problem, choose from three difference governance modes to find solutions for problems: market, authority-based hierarchy consensus-based hierarchy (Nickerson & Zenger, 2004, p. 623). The market where solutions can be acquired refers to any source of solution external to the boundary of the firm. BIs can be such source of expertise. Both authority-based and consensus-based hierarchies refer to solutions developed internally. In this case, BIs can also be a source of expertise as facilitators or problem co-solvers. Any governance mode tenant firms' managers eventually choose will yield the creation of important

capabilities within the firm (Nickerson & Zenger, 2004). The BIs intervention can be assessed in the amount of problems they participated in finding solutions to. In other words, BIs intervention can be measured in the amount of problems solved with their support.

We investigate to what extent BIs help their tenants in their development process. The underlying assumption is that BI's tenants experience problems and look for support to solve them. The support delivered leads desirably to solved problems which will in turn contribute to enlarge the firm's knowledge base and increase their capabilities (Nickerson & Zenger, 2004). Capabilities are the source of firms' competitive advantage (Eisenhardt & Martin, 2000). If BIs contribute actively to problem solving and the consequent firm capabilities building, then they are facilitating their tenants' development and have a positive impact in company growth and long term survival. We compiled a list of developmental problems in four key areas inspired by social systems theory (Parsons, 1964) and its recent developments applied to entrepreneurship (Groen, Wakkee, & De Weerd-Nederhof, 2008). Furthermore, entrepreneurship and strategic management literature were used to derive specific problems.

Our empirical setting are 12 BIs located across six Northwestern European countries and their respective tenants. We surveyed more than 350 tenants about the mechanisms of support provision. Tenants were asked which problems they experienced since the beginning of the incubation period. Of those, we enquired on whether support was sought and where (incubator, fellow tenants or outside). This allowed us to calculate the total number of problems experienced, the total amount of support of several sources and the total amount of problems solved. We will examine how these aggregated measures are related, using a process approach to problem solving.

Our contribution is manifold. We provide a novel framework to measure incubation based on the theoretical insights of knowledge based theory of the firm (e.g. Nickerson & Zenger, 2004) and capabilities thinking (e.g. Dosi, Nelson, & Winter, 2000). We also shed light on the incubation process by examining which factors

determine seeking support and solving problems within firms undergoing an incubation experience. Finally, we contribute to a better understanding of capabilities building through the problem solving process within firms.

This paper is structured as follows. We start by identifying the nature of BI, discussion definitions and exploring conceptualizations. Next, we develop models and craft hypotheses under which we can assess the BI's intervention. The problem solution framework is present subsequently. In the Methodology section, we describe our empirical setting and how variables were operationalized. After presenting the results, we discuss our findings and suggest future directions to research. We conclude by summarizing our contribution and implication to both research and practice.

5.2 The nature of business incubators: theory and hypotheses

Both researchers and practitioners have proposed definitions for business incubation. Yet interestingly no rationale for their existence or their activities has been thoroughly discussed. In this section, we discuss the operational definitions of BIs. Further, we advance BI literature by suggesting that in any way practitioners and researchers define BIs, the rationale for their existence lies in economic theory of growth and entrepreneurship. Similarly, we will show that the rationale for BIs' activities can be found in strategic management literature. Finally, we also address the gap of most incubation studies being atheoretical (Hackett & Dilts, 2004) by proposing an empirical framework to analyze business incubation impact on company development.

5.2.1 What is a business incubator?

Several attempts to define BIs have been put forth by both researchers and practitioners (Aernoudt, 2004; Barrow, 2001; Bergek & Norrman, 2008; EC, 2002; Hackett & Dilts, 2004; NBIA, 2007; Rice, 2002; Smilor & Gill, 1986; UKBI,

2007). Using the industry definitions, BIs are mostly property-based organizations with the mission of business development using knowledge agglomeration and resource sharing (NBIA, 2007; Phan, Siegel, & Wright, 2005; UKBI, 2007). They set out to create firms as well as to support them during their first years of existence (Hackett & Dilts, 2004). Practitioners frequently tout the benefits of BIs to be manifold and on several levels: regional development, job and wealth creation, and entrepreneurship promotion are among those.

The potential effect that BIs might have on the creation of job and wealth finds its reason in economic theory of growth and entrepreneurship literature. In the 1950s, Robert Solow was the modern pioneer in modelling economic growth by putting technical progress central in the creation of wealth in advanced economies (Solow, 1956). Today, the notion that technology change is responsible for economic growth is widespread (Aghion & Howitt, 1997; Romer, 1990). According to this view, growth is driven by technological change created endogenously and intentionally by purposed investments in the creation of knowledge. More recently, Audretsch (2007) suggested the mechanism through which new knowledge is brought to the market, creating new products and services, is entrepreneurship. This definition is in accordance with previous work since it considers the creation of new firms as essential (e.g. Low & MacMillan, 1988) as well as the exploitation of new market opportunities (Shane & Venkataraman, 2000). BIs position themselves as tools to help bridging the gap between knowledge creation and markets.

As their name celebrates, BIs are safeguarded environments where new firms can establish and develop sheltered from the rougher market competition. The new firm will be thus protected during its first years of existence and guided till it achieves the necessary maturity to eventually graduate. The underlying rationale to protect firms during its first years can be found in the resource based view of the firm (RBV). According to this stream of literature, nascent firms lack the necessary resource base to maximize their chances of survival. Furthermore, assembling a stable resource base is a challenge to any entrepreneurial team (Brush, Greene, & Hart, 2001). Resources which are valuable, rare, inimitable and non-substitutable

(Barney, 1991), are at the core each firm's competitive advantage. Shortage of resources might keep new firms from striving for competitive advantage since they must divert their limited resource base to the necessary operational routines to survive. The combination of these effect creates a liability of newness (Carroll, 1983); this phenomena tends to favor older firms given their reliability, accountability and broader customer base (Freeman, Carroll, & Hannan, 1983; Hannan & Freeman, 1984). BIs counter this effect providing their tenants with resources.

BIs are designed to provide their tenants with three main types of resources: infrastructure, business support and access to networks (Barrow, 2001; EC, 2002; Smilor & Gill, 1986). Infrastructure is the basic resource provided by BIs (Allen & McCluskey, 1990). Typically, this is a key in hand office space located in a building where more incubated companies are housed. Office space is often bundled with complementary services such as parking, meeting rooms, receptionist and telecommunications (Aerts, Matthyssens, & Vandenbempt, 2007; EC, 2002). Some BIs also provide specialized premises such as laboratories or technical equipment (Grimaldi & Grandi, 2005). Business support is the main mechanism through which knowledge is transferred to the nascent firm. Services such training, coaching or mentoring are normally provided (Bergek & Norrman, 2008; Carayannis & von Zedtwitz, 2005; Peters, Rice, & Sundararajan, 2004). Finally, having the possibility to access the BI's network of contacts completes the resource pool tenants can profit from (Bøllingtoft & Ulhøi, 2005; Nowak & Grantham, 2000).

An extension to the RBV thinking suggests that resources are not enough to confer sustained competitive advantage to firms. The success of firm is influenced by their capabilities (Eisenhardt & Martin, 2000) defined as a collection of routines (Winter, 2003) aimed at solving problems and achieving a certain outcome (Zahra, Sapienza, & Davidsson, 2006). Capabilities are the result combination of non-automatic routines embodying managerial deliberation, action, planning and expertise (Dosi, Nelson, & Winter, 2000). Using RBV and capabilities insights, we can say that BI should provide resources to their tenants but also show them how to combine

resources in order to build organizational capabilities. Graduation from the BI should occur when tenants firms have developed the necessary capabilities to survive when put freely in the market.

In summary, BIs become important agents for economic growth and job creation when conducting incubation processes through which new firms have enough resources available to cope with their intrinsic liability of newness. At the same time, BIs maximize their tenants' chances of survival if ensuring that incubated firms develop an important level of capabilities. We now turn our attention to discuss how BIs can help their tenants to create such capabilities.

5.2.2 Business incubators as problem (co-)solvers

One of the ways BIs have to participate in company development is by helping their tenants solving problems. Every firm experiences developmental problems according to its stage of development (Kazanjian, 1988). The BIs' function is to help nascent and young companies to solve these problems; this kind of support would accelerate the learning curve of the new firm and, at the same time, contributes directly to firm's capabilities creation (Zollo & Winter, 2002). The premise that problem solving is central in the creation of capabilities provides the base for the knowledge based theory of the firm (Hsieh, Nickerson, & Zenger, 2007; Nickerson & Zenger, 2004). According to this view, managers choose to solve each problem they encounter by balancing the cost of finding one solution and the expected value of the solution's use (Nickerson & Zenger, 2004). There are three fundamental governance modes that the firm can use to solve its problems: market, authority-based hierarchy and consensus-based hierarchy (Hsieh, Nickerson, & Zenger, 2007; Nickerson & Zenger, 2004). Solutions found in the market are arguably the easiest way to solve problems. In this case, managers choose to acquire the necessary knowledge externally to the firm. In both authority-based and consensus-based hierarchies, solutions are developed internally. Managers choose each mode according to the cost of the solution and the value of the expected solution. In this study, we are not examining the details of how the

firm solves its problems but rather looking at where the firm seeks support for solving its problems. Therefore, in the BIs context, the underlying assumption is that managers, when facing a developmental problem, will choose from different sources of help to solve it (or not seek help at all). For BIs' tenants, looking for solutions in the market or using BIs as problem co-solvers is the easiest and most affordable way for two reasons. First, BIs have the resources and capabilities needed for business development. Second, the incubated firm has access to incubation services that are most likely more economical than similar services available elsewhere.

BIs are important partners in building capabilities if having an important role in solving tenants' developmental problems. This function is independent from providing resources. While resources such as infrastructure, business support and access to networks are important and valuable for young firms, they are not necessarily helping tenants to solve their problems. This bundle of resources is probably more helpful to establish a firm but not for preparing it for the post incubation stage. Consider the example of business support, more specifically, the often offered service of training. Training sessions and dissemination of certain information are a valuable and potentially an important source of knowledge. Yet it is unlikely that this resource alone contributes to solve developmental problems beyond the expected and predictable ones. If a firm faces a difficult challenge, such as putting new products in the market, a short lecture in marketing is not enough. The solution for such a problem is complex and costly to the firm. We now use these insights to derive hypotheses and submitted them t empirical testing.

5.2.3 Crafting models and building hypotheses

The process of solving problems is modelled as shown in Figure 5.1 – Conceptual model for solving problems for firms located within business incubators. We analyse separately what determines seeking support and solving problems. The left part of the figure – Model 1 – allows us to show what determines seeking support.

The right part of the figure – Model 2 – explores which characteristics of both the BI and the firm explain solving problems.

Model 1. Our first model seeks to investigate what firms' characteristics determine seeking support. Empirical research on BIs suggests that tenant firms might value the incubator's bundle of available resources differently in each stage of their development (McAdam & McAdam, 2008). This effect is more pronounced the more rigid a certain service is delivered. For instance, infrastructure provision is unlikely to change during the incubation period of a given firm. Being located within a BI might be extremely important when the firm is starting, providing an economical bundle of services as well as an external signal of acceptance as a promising company. This contributes to reduce the liability of newness firms face at this point of their development (Singh, Tucker, & House, 1986). Yet towards the end of the incubation period and as the firm matures, being located within this same environment, sharing office and resources with younger firms can be perceived as negative by tenant firms (McAdam & McAdam, 2008). Similar reasoning can be applied to business support services and access to networks. As the firm grows older, business support services progressively become less meaningful and needed for the tenants firm. Services such as coaching might be crucial in earlier stages of a venture but become progressively less important as the knowledge gap between firm and coaches narrows. Young ventures also make different use of a professional network of contacts. We hypothesize therefore that age is negatively correlated to support seeking.

H1a: Tenant firms' age has a negative effect on seeking support.

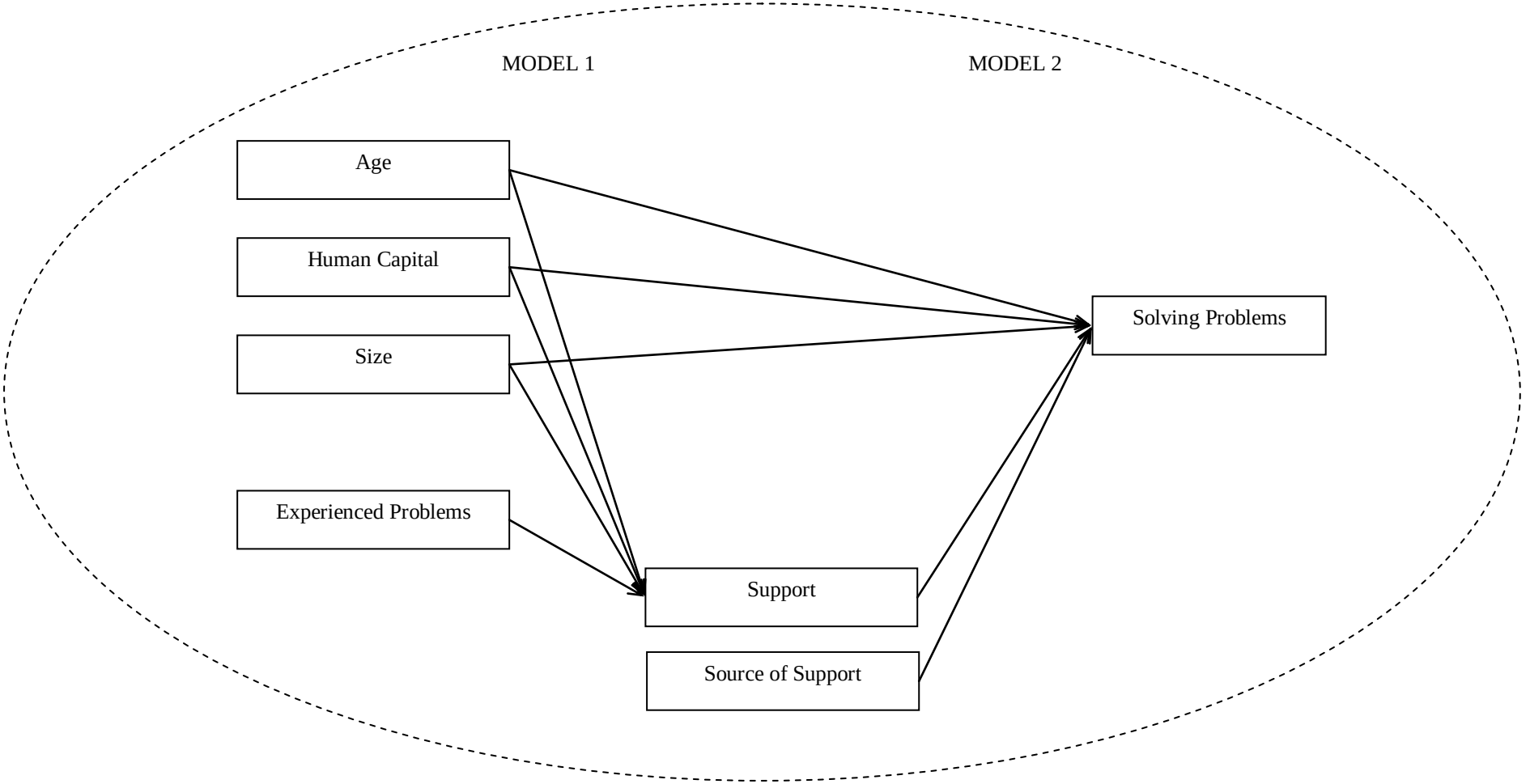

Figure 5.1 – Conceptual model for solving problems for firms located within business incubators

[Legend: Model 1: Seeking Support = f (Age, Experience, Size, Problems); Model 2: Solving Problems = f(Support, Source of Support, Age, Experience, Size)]

The same line of reasoning applies to human capital. Founders' human capital has been shown to have a positive impact on new firms' growth (Colombo & Grilli, 2005; Cooper, Gimeno-Gascon, & Woo, 1994; Feeser & Willard, 1990). New business opportunities are most likely to be successful if pursued by teams who are capable of integrating different kinds of context-specific knowledge (cf. Grant, 1996). This means that teams containing individuals with higher levels of school attainment and specific experience are more likely to, not only identify entrepreneurial opportunities, but also to seize them. Also, these teams are better qualified to make better strategic decisions for the firm's development (Colombo & Grilli, 2009). In terms of seeking support, we can hypothesise that tenant firms with greater human capital will seek less support. For instance, more experienced teams have more experience in dealing with situations of shortage of resources, typical of the earlier stages of each venture. Also, such entrepreneurs have already developed firm capabilities previously and therefore will not necessarily look for support to do so.

H1b: Tenant firms' human capital has a negative effect on seeking support.

While being incubated, firms will grow in absolute and relative terms. Firms located within BIs cannot grow steeply during their incubation period mainly due to the BIs' space constraints. Yet size of firms strengthens its capabilities (Zahra, Sapienza, & Davidsson, 2006) which suggests that entrepreneurs will look for less support as the firm grows.

H1c: Tenant firms' size has a negative effect on seeking support.

Model 2. Our second model illustrates which characteristics of both the BI and the firm explain solving problems. Finding solutions with the aim of solving specific problems is at the core of the knowledge based theory of the firm and it is the chief mechanism by which the firm builds its capabilities (Grant, 1996; Nickerson & Zenger, 2004). Two main governance modes are typically adopted by managers to search for solution: internal and external to the firm. In an incubation environment, it is most likely that tenant firms seek support externally to the firm. The positive

role of external support in small firm performance already received empirical confirmation (Robson & Bennett, 2000). We thus hypothesise as follows.

H2a: Support has a positive effect on solving problems.

H2a refers to any kind of support sought. Yet the value of support can depend on its source. BIs are specialized sources of support and typically designed to solve developmental problems of early stage ventures. Furthermore, from the tenants' perspective, if a venture is located within a BI, it is easier and therefore more likely for managers to look for support within that same environment. This is what we dub the incubation hypothesis. If confirmed, the incubation hypothesis contributes to a better understanding of the role of BIs in developing their tenants. H2b follows.

H2b: Support by the incubator's team has a positive effect on solving problems.

There are more sources of support for a venture located within a BI. For instance, literature has been touting the fact that companies sharing a common infrastructure might develop important networks with the aim of sharing knowledge and mutual help (Barrow, 2001; Totterman & Sten, 2005). H2c is what we dub as interaction hypothesis. The results concerning this hypothesis will throw light on the question of whether housing nascent firms under the same roof can create meaningful synergies between them.

H2c: Support by fellow tenants has a positive effect on solving problems.

There is yet another source of support for BI tenants. Tenant firms can also make use of their personal network of contacts. This means that when facing a problem, tenants firms would go directly outside to look for a solution, not making direct use of any of the BIs' services or the BIs' network. H2d follows.

H2d: Support directly outside has a positive effect on solving problems.

Note that the support sought has a positive effect in solving problems, regardless of its origin. The fundamental difference between this set of hypotheses is related to what they try to explain in terms of BIs' characteristics. H2b posits the value of the

BI's services to tenants firms. If solving problems is explained by enjoying support from the incubator, then the services provided are of undeniable value, ceteris paribus. H2c suggests the value of the networks created by tenants located within the same building. Finally, H2d hints on the possible value of each firm independence in relation to the BI, looking for help within its own network..

Tenants' characteristics will also impact the way problems are solved. Incubation programs do not usually graduates classes of companies. This means that the tenants firms' age is not the same across all tenants. Despite the short incubation period – maximum of five years (EC, 2002) – it is expected that these firms change during this period. For instance, it is during the first years of activity that firms find a valuable strategy (Feeser & Willard, 1990), shape their target markets (Santos & Eisenhardt, 2009) and start developing their routines and capabilities (Zahra, Sapienza, & Davidsson, 2006). It is thus reasonable to assume that firms towards the end of the incubation period are more capable of solving their problems. Also, firms housed longer within the BI will have already solved some problems either with or without help. This experience also contributes to build their capabilities. H3a follows.

H3a: Tenant firms' age has a positive effect on solving problems.

Tenants' human capital also impacts the outcome of problem solving. Although tenants look for support to solve problems, this does not rule out their own action. During the incubation period, tenant firms have access to the incubator's pool of resources. Take the example of a resource such as access to networks. Tenants accessing the specialized BI networks develop contacts with venture capitalists, among other. These actors are important sources of knowledge and are known to develop young firms in terms of human capital and creation of routines (Hellmann & Puri, 2002) accelerating their learning curve and contributing to their professionalization. Learning is responsible for the creation of capabilities (Zollo & Winter, 2002) as well as the emergence of routines (Salvato, 2003). Hence, we hypothesize that the firm's human capital will impact positively solving problems.

H3b: Tenant firms' human capital has a positive effect on solving problems.

During the incubation period firm will still grow in absolute and relative terms. Size of firms also contributes to strengthen its capabilities (Zahra, Sapienza, & Davidsson, 2006). H3c follows.

H3c: Tenant firms' size has a positive effect on solving problems.

Tenants' age, human capital and size all impact positively problem solving after they looked for support. In other words, our model suggests that age, human capital and size impact negatively looking for support while the same characteristics will enable the firm to better solve their problem after looking for that same support. Yet this is not paradoxical. More mature, experienced and bigger firms will be less likely to look for support; when they do, they more likely to solve their problems cooperating with the support given by whichever source.

5.3 The problem solution framework

We set out to research what the role of BIs is in terms of helping their tenants to solve developmental problems. Our theoretical framework suggests that when BIs help their tenants to solve problem, they are not only making use of the available resources but also facilitating and accelerating the creation of capabilities within the new venture. Our operationalization accounts for 20 problems which, if solved, have the potential to contribute to the creation of firm routines and capabilities. We build on previous work on determinants for venture growth and start-up firms' needs to identify the most common developmental problems faced by nascent firms. We organize the problems in four main areas: strategy, economic, managerial and networks (Groen, Wakkee, & De Weerd-Nederhof, 2008; cf. Parsons, 1964). (Table 5.1).

Strategy problems

Strategic decision is of crucial importance for any firm. Strategy involves the choice of how a firm will create value for its customers, satisfying their needs better than

its competitors (Porter, 1996). The main problem in this area is *gaining advantage over competitors*. Firms which achieve competitive advantage will show superior performance. This happens as a result of superior rents stemming from either lower production costs or provision of greater value to customers for comparable costs (Porter, 1996). For incubated firms, this is most likely to happen in two ways: either by putting new products or services in the markets; or buy generating whole new business ideas. Therefore, we included *introducing new products* in the market as a developmental problem for start-ups together with *generating new business ideas*. Arguably, for a nascent firm the question would not involve new business ideas or new products but rather *the* product or *the* idea. Yet nascent entrepreneurs continuously evaluate the set of opportunities they pursue and valuable opportunities can emerge from the continuous development and modification of ideas (Dimov, 2007). This is the case during early planning but can also happen during the first stages of each venture (Dimov, 2009). Further, improvisation is an important way to develop dynamic capabilities in young firms (Zahra, Sapienza, & Davidsson, 2006).

Time to market products and services can also be a critical strategy problem, particularly in highly dynamic environments. Equally important in terms of strategic problems is *writing and presenting a business plan*. BI do not typically include a written business plan as part of their selection criteria (cf. Aerts, Matthyssens, & Vandenbempt, 2007; J. R. Lumpkin & Ireland, 1988). However, nascent ventures frequently need a formal business plan to access external financing, for example from venture capitalists (Honig & Karlsson, 2004). The positive effect of early planning on firm performance and survival has received empirical support (Delmar & Shane, 2003; Schwenk & Shrader, 1993) although this relationship is contingent to the external environment (Gruber, 2007) and purpose of planning (Burke, Fraser, & Greene, 2009). Finally, lack of *credibility* might be part of the liability of newness of nascent firms (Singh, Tucker, & House, 1986) and a hurdle to achieve a sustainable financial situation (Vohora, Wright, & Lockett, 2004).

Table 5.1 – List of problems and references organized according to Groen and colleagues (2008)

Area	**Problems (grouped according to Groen, Wakkee, & De Weerd-Nederhof, 2008; cf. Parsons, 1964)**
Strategy	Get advantage over competitors
	Introduce new products in the market
	Generate new business ideas
	Accelerate Time-to-Market of products
	Write/Present BP
	Increase credibility
Finance	Obtain finance
	Improve cash flow
	Save on labor costs
	Save equipment costs
Management	Professionalize management
	Increase entrepreneurial skills
	Hire personnel
	Comply administrative regulations
	Develop new technology
	Find office/production space
	Get additional external advice
Networks	Build/expand market base
	Establish suppliers contacts
	Ally with enterprises

Financial problems

Imperfections in the capital markets have long been identified as a constraint to firm's financing (Hubbard, 1998; Stiglitz & Weiss, 1981). The situation is even more acute for nascent firms, particular for the high-tech (Carpenter & Petersen, 2002). The reason is that nascent firms typically lack a track record to base their negotiation with investors. Further, uncertainties in the entrepreneurial process (cf. Davidsson, 2004) make it harder to distinguish the high-potential entrepreneurs from the low-potential ones. Nascent also frequently lack collateral (or have low

value ones) and therefore mostly rely on personal capital (see, for instance, Berger & Udell, 1998). We captured this in the *obtaining finance*. In our view, the BI can help tenants to access finance in several ways: direct subsidies, contacts with venture capitalists or business angels are examples of those. Problems such as *improve cash flow, saving on labor* and *equipment costs* are also problems which, if solved, develop important routines and capabilities within the nascent firm.

Managerial problems

Since Penrose's seminal contribution to the theory of the firm (Penrose, 1959) that the lack of management skills is seen as a major constraint to growth. This is known as the Penrose effect (Thompson & Wright, 2005) and it has enjoyed empirical support since (Richardson, 1964; Shen, 1970). We choose to capture this effect in the problem *professionalize management*. A more specific type of skills beneficial for entrepreneurs are the so-called *entrepreneurial skills*. These include autonomy, risk taking and proactiveness, among others (Brockhaus, 1980; Gartner, 1985; Lumpkin & Dess, 1996). Yet firms do need only to professionalize their own management skills but also to *hire personnel*. As the firms matures, enlarging personnel is crucial to build and strengthen firm's capabilities (Zahra, Sapienza, & Davidsson, 2006). Nascent firms are often faced with an array of new activities that go beyond their core business idea. Regulatory and legal procedures such as accounting or lawyers are an example of this. Such contractors can also be important source of advice (Bennett & Robson, 1999; Gooderham, Tobiassen, Doving, & Nordhaug, 2004). We formulated this in the problem *compliance with administrative and legal regulations*. An additional problem BIs can help their tenants to solve is to *develop a new technology*. This is however highly contingent to the type of incubated companies and the resources available within the BI. We also included *find office or production space* to capture help immediately before graduation. Incubated companies sometimes need additional production space to manufacture prototypes and small production series without necessarily being ready for graduation (see individual case studies in OECD, 1997; OECD, 1999; Ratinho, 2007 for insightful examples). Finally, we also formulated a problem to capture the

broker function of BIs (cf. Nowak & Grantham, 2000). It is difficult for a BI to have in-house al the necessary expertise to help tenants solving their problems. For instance, services such as venture capital (Hackett & Dilts, 2004) or specialized knowledge (Becker & Gassmann, 2006). We included *getting additional external advice* as a problem on the management group.

Network problems

The value of networks for nascent and young firms has long been confirmed empirically (Birley, 1985; Hoang & Antoncic, 2003; Parker, 2008). The rationale behind the value of networks for firm development can be found in social capital (e.g. Portes, 1998); its impact on firm performance has also received broad empirical support (e.g. Davidsson & Honig, 2003; Yli-Renko, Autio, & Sapienza, 2001). Social capital exists in the relationships between people and allows its bearer to access different resources when using it (Coleman, 1988). The main assumption here is that nascent firms need not only to assemble the right resources to establish themselves but also a proper network of contacts to develop successfully. Since the idea shaping phase (Dimov, 2007) till more mature firm stages, entrepreneurs rely on networks to gain to access important information and advice (Hoang & Antoncic, 2003). The interactions within the network range from the entrepreneur's personal contacts – family, friends or colleagues – to the more professional ones – business partners, investors, contractors, suppliers and employees (Greve & Salaff, 2003). We formulated problems in this area using this insight. *Build and expand market base* and *establish suppliers contacts* are therefore problems of the network group. *Establishing alliances* with other companies has a potential value for firm (e.g. Gulati, 1998). Particularly for nascent companies, alliances with key partners have an important impact in their performance and long-term survival (Gomes-Casseres, 1997).

5.4 Methodology

5.4.1 Research design and context

Our population of BIs are the 12 BIs part of Nensi – North European Network of Service Incubators. Nensi is a network of 12 service incubators located in six Northwestern European countries. The project was funded by the European Union and ran from 2005 till 2008. During this period, data on both BIs and their respective tenants were collected. The initial goal was to monitor tenants during the project period and therefore two questionnaires were developed (for a detailed description of both questionnaires and the monitoring tool see Jenniskens, 2006).

The questionnaire sent to business incubation managers included questions on their mission, strategy, focus, stakeholders, university linkages and location. Furthermore, other information on operational features such as tenants' profile, cost structure and business services portfolio was also part of the survey. We triangulated this data with complementary data gathered during site visits as well as compiled information in the public domain (Yin, 2003). Site visits included interviews with the incubation managers and other key staff. These interviews were semi-structured and the script based mostly on the analysis of the returned questionnaires. This allowed us also to clarify response in the questionnaires and to confirm some of the data already collected by alternative wording of the same questions (Fowler, 1995).

Questionnaires sent to tenants were focused on the dynamics of solving problems. We also asked about other characteristics such as size, age or founders' human capital. Due to time constraints, reduced availability of the research team and the geographic location of the BIs, the data collection next to tenants was managed by their respective BI manager. BI managers were trained during the project group meetings and assisted closely by the first author during the data collection phase. Also, digital worksheets were developed to aid BI managers to collected and send

the research team their tenants' data. In some cases, where inconsistencies arose in the collected questionnaires, tenants were contacted to provide further data.

In this paper, we use data collected between 2006 and 2008. Every tenant was asked about problems experienced since the beginning of their incubation period. The Nensi network was formed by similar BIs, defined by themselves as service business incubators. Although some standardisation of each BI service portfolio occurred during the project, there is no reason to assume that the problem solving capabilities of each Bi changed during this period. Therefore, we considered our data to be cross-sectional despite the fact that it was collected during a there year period. This also allowed us to increase the surveyed tenant population.

5.4.2 Measuring experienced problems, support sought and problems solved: dependent and explanatory variables

We captured tenants' problems using dichotomous variables and asking managers whether they had experienced that specific problem. We subsequently enquire on whether support was sought and where it was sought. Three options were given to respondents: incubator team, fellow tenants and directly outside. "Incubator team" capture any kind of support given directly by the incubator manager or anyone part of the incubator. For instance, it is typical that BIs assign coaches to their tenants (Barrow, 2001; Smilor & Gill, 1986). "Fellow tenants" investigates one among the benefits often claimed by practitioners, i.e., the benefits arising from the creation of synergies among BI's tenants. Finally, "directly outside" investigates whether tenants seek support directly outside, making use of their personal network of contacts.

Measuring experienced problems, support sought and problems solved allows us to analyze the whole process of solving problems (Figure 5.1). In this contribution, we utilize aggregated measures to investigate what determines support seeking and subsequent problem solving. Our dependent variables are Total Amount of

Problems for which Support was Sought (Model 1) and Total Amount of Problems Solved (Model 2). Total Amount of Problems Experienced is used as an explanatory variable in Model 1. The aggregated measures of the sources of support (Total Amount of Support given by the BI, Total Amount of Support given by Fellow Tenants and Total Amount of Support given Directly Outside) are used as explanatory variables in Model 2 (Figure 5.1).

We used age, human capital and size also as explanatory variables. Age was measured in years and size in full time equivalent employees. Human capital was captured by two variables: average work experience prior to the firm foundation (in years) and prior experience in starting businesses. In case of entrepreneurial teams, we computed the average years of experience. Prior experience in starting a business is coded 1 when at least one member of the entrepreneurial teams has such experience. Our operationalization of human capital follows previous studies on entrepreneurship and dynamics of small firm growth (Davidsson & Honig, 2003; Johnson, Conway, & Kattuman, 1999).

5.5 Results

The results section is organized as follows. Table 5.2 provides the descriptive statistics and bivariate correlation between all variables. Table 5.3 presents the ordinary least squares (OLS) estimators for Models 1 and 2. The results presented in the latter are central to our hypotheses.

Table 5.2 shows that tenants firms experience far more problems than the ones they seek support for. The total number of problems for which support sought is roughly half of the total number of problems experienced. Of those, the majority of support is seemingly sought directly outside. Support next to fellow tenants is the smallest source of support. We note that the independent variables show low bivariate correlations (Table 5.2). The values are generally well below 0.70 suggesting discriminate validity between the variables (Cohen, Cohen, West, & Aiken, 2003). For example, considering solely the several sources of support, the bivariate correlation is below 0.30. The only correlation pair above 0.70 is between the total

amount of support sought and the total amount of support sought directly outside (formatted bold). Yet these variables are not present in the same regression models. Therefore, multicollinearity did not affect our estimation results.

The results from the regression models are presented in Table 5.3. Model 1 estimates the determinants of looking of support. We expected that age, human capital and size would determine the tenant firms' support seeking patterns. Yet results show that support is sought by every tenant who experienced problems. We can thus reject H1a, H1b and H1c. This means that the only determinant variable in seeking support when located within a BI is experiencing problems. In other words, when housed inside a BI, firms seek support regardless of their age, human capital or size.

Table 5.2 - Descriptive Statistics and Bivariate Correlation Matrix

		Mean	S.D.	1	2	3	4	5	6	7	8	9
1	Total number of problems solved	6,22	4,46									
2	Total number of problems experienced	10,52	4,98	0,644								
3	Total number of problems for which support was sought	5,33	4,44	0,661	0,633							
4	Total number of support sought within the incubator	2,16	2,99	0,601	0,462	0,638						
5	Total number of support sought next to fellow tenants	0,59	1,51	0,096	0,149	0,365	0,175					
6	Total number of support sought directly outside	3,45	3,76	0,510	0,561	**0,828**	0,248	0,234				
7	Current age	4,63	5,04	-0,260	-0,256	-0,235	-0,165	-0,015	-0,230			
8	Employees	3,25	3,47	0,077	0,102	-0,054	-0,027	-0,098	-0,028	0,384		
9	Prior business start experience	0,36	0,48	-0,037	0,101	0,185	0,055	0,281	0,255	-0,037	0,235	
10	Average work experience	9,44	6,73	-0,114	0,073	0,003	0,004	0,000	0,054	-0,160	-0,155	-0,079

N=73

Table 5.3 – OLS estimation of support sought and problems solved

	Dependant Variable		
	Total Problems for which Support was Sought	Total Problems Solved	
	Model 1	Model 2a	Model 2b
Constant	-0,032 (1,308)	5,413 (1,133)****	5,768 (0,969)****
Total number of problems experienced	0,565 (0,087)****		
Total number of problems for which support was sought		0,566 (0,100)****	
Total amount of support sought within the incubator			0,634 (0,123)****
Total amount of support sought next to fellow tenants			-0,039 (0,250)
Total amount of support sought directly outside			0,430 (0,105)****
Current age	-0,015 (0,093)	-0,180 (0,089)**	-0,144 (0,083)*
Employees	-0,200 (0,135)	0,277 (0,126)**	0,242 (0,118)**
Prior business start experience	1,402 (0,876)	-2.436 (0,872)***	-2.518 (0,852)***
Average work experience	-0,038 (0,062)	-0,106 (0,061)*	-0,123 (0,056)**
R^2	0.442	0.447	0.553
F	10,612****	9,204****	9,704****
N	73	63	63

* $p \leq 0,1$; ** $p \leq 0,05$; *** $p \leq 0,01$; **** $p \leq 0,001$

Models 2 estimate what determines problem solving among tenant firms. The number of cases is, in these models, smaller since we only considered companies which experienced at least one problem. Model 2a estimates that, in the aggregated level, tenants solve their problems benefiting from support regardless of the source, therefore confirming H2a. Model 2b confirm the hypotheses concerning support given by the incubator and directly outside (H2b and H2d) while providing no support for the interaction hypothesis (H2c). This means that tenants are in fact receiving useful support from the BI but not from their fellow tenants. In both models, we observed that age and human capital have a negative effect in solving problems while the number of employees contributes positively to solving problems. This confirms H3b while providing no support for H3a and H3c. Tenants are therefore solving fewer problems when they are older and more experienced but profiting from growing in terms of solving their developmental problems.

5.6 Discussion

Prior research on BIs has focused on descriptive studies in which the BI's service portfolio and the overall incubator's impact are described as positive to their tenants' performance and survival (EC, 2002; Knopp, 2007; Smilor & Gill, 1986). Yet the tenants are seldom enquired on their perception about the BI's availability of services or the impact of the BI's intervention in the firm. We addressed this gap directly by developing a framework that makes possible to measure the overall BIs intervention using data collected next to tenants.

Our conceptualization of BIs' defines them as collaborative partners in helping nascent firms to solve their development problems. We divided our conceptual framework in two distinct models: first, we analysed what determines seeking support; and second, we investigated what explains problem solving, focusing on the different sources of support. The results of the first model show that tenants seek support when they experience a problem independently from their age, human capital levels and size, as initially hypothesized. We also tested the robustness of these results using as dependent variable the several sources of support (incubator,

fellow tenants and directly outside) and the results hold. According to the knowledge based theory of the firm, managers choose between two basic mechanisms to build their capabilities by solving their problems: find solutions in the market or develop solutions within the firm (Nickerson & Zenger, 2004, p. 619). Further, the most valuable problems are the ones which, after solved, yield the most desirable capability to the firm. Therefore, solving a problem is a balance between a) the value of a solution and b) the costs of finding one. For managers located within a BI, the obvious decision on where to look for solutions for developmental problem is inside the incubator. This is arguably the cheapest, easiest and geographically closest to the firm option to begin solving whichever problem. In fact, the reason behind looking for solutions also next to fellow tenants follows the same reasoning. Looking for support directly outside the incubator is also a low cost option to start searching for solutions for problems, assuming that tenants are using in this case their personal network of contacts. Ultimately, it is also the reason why tenants chose to be located within a BI in the first place.

The results of our second model show that companies which seek support within the incubator and directly outside are more likely to solve their problems. This confirms the incubation hypothesis (H2b) showing that BIs help their tenants to solve their developmental problems. This finding provides evidence of the positive effect of the BI's intervention. This is an extremely important result because it confirms the value BI have in helping nascent firms in their first stages of existence. It also sheds light on the potential value of business support BIs can provide to their tenants. In theory, BIs can only help solving tenants' problems if they possess the capabilities needed to perform an effective incubation process. Our results suggest that this is true within the BIs in our sample. The BIs' service portfolio was not part of our research. Yet we can posit that such services are effective to the extent that it is through the provision of those that tenants get the assistance needed to solve their problems. Previous work already discussed the need for a match between tenants' needs and BI's services (Lee & Osteryoung, 2004). This finding suggests that the service portfolio is customized to tenants' needs given the contribution of the BIs in solving tenants' problems.

At the same time, we did not find support for the interaction hypothesis (H2c), i.e., tenant firms do not interact with each other in a meaningful manner. Arguably, tenants may still have frequent and close contacts but not to the extent that such relationships yield significant contributions in terms of solving developmental problems. In essence, this finding counters the stylized fact that tenants' interaction is frequent and useful for tenants (e.g. Sherman & Chappell, 1998). Further, it adds to the finding that tenant interaction is not sophisticated but rather informal and supportive (Totterman & Sten, 2005, p. 503). In addition, our evidence confirms that such relationships are not contributing to help tenants building each others capabilities by solving developmental problems.

We also found support for the hypothesis that support sought directly outside has a positive effect in tenants' development (H2d). The coefficient is somehow smaller suggesting that while this source of support is important, it does not outperform the incubator support. The importance of the entrepreneurs' personal networks of contacts in the early stages of a venture has already been researched (e.g. Birley, 1985) and its positive impact in young firms empirically confirmed (Zhao & Aram, 1995). The fact that tenants firms seek support for certain problems directly outside can be interpreted as a result of the value perceived within their personal network. Yet despite the emphasis literature has put in learning though partnerships (Yli-Renko, Autio, & Sapienza, 2001) and building capabilities through interorganizational relationships (Grant & Baden-Fuller, 2004), our results suggest that the problem solving process taking place within the BI has a bigger effect. This translates into a bigger contribution of BIs than that of networking and partnering.

The hypotheses concerning age and human capital were not confirmed. While we theorized that age and human capital would impact positively the total amount of problems solved, data show that the opposite happens. Older companies solve fewer problems, that is, the total amount of problems solved decreases with age. This finding is counterintuitive and not in accordance with the capabilities perspective used to derive our theoretical framework. Age and capabilities correlate positively (Zahra, Sapienza, & Davidsson, 2006; Zollo & Winter, 2002) and therefore, it is

expected that companies towards the end of their incubation process would solve more problems, even without any external support. Yet it can also be argued that as companies develop, they experience different kinds of problems (Kazanjian, 1988), their complexity increases as well as the value of the solutions. This may render BI support as less effective or even incapable of helping. Consider for instance managerial problems, one of the groups of problems we investigated. BIs are capable of helping nascent firms to solve their managerial problems. However, as the venture grows, the firm's managerial needs change and so does the intensity each problem in this area. As problems become more complex and require different approaches to find solutions (cf. Nickerson & Zenger, 2004), the BI decreases its ability to provide capable help. BIs are specialized in solving nascent and young firms' problems. Hence, the reason behind age being negatively related to the total amount of problems solved might be the complexity of those problems together with the limited and finite BI capabilities.

Similar reasoning can be applied to human capital. Both prior experience in starting business and average work experience have negative coefficients due to the propensity of more experienced entrepreneurs identifying more specific and complex problems. The entrepreneurs' human capital has been identified as determinant for business longevity (Bates, 1990), start-up size (Colombo, Delmastro, & Grilli, 2004) and identification of opportunities (Shane, 2000). Also, industry specific knowledge (Colombo & Grilli, 2005) and prior business ownership (Mosey & Wright, 2007) also play a role in growth and survival. We suggest that these positive effects are related to faster problem identification and subsequent solving. It follows that only the more complex problems are the ones for which support is actually sought. Consider the example of a team of experienced engineers starting their third company aiming to commercialize a new product in an existing market. This entrepreneurial team will not likely seek support during the initial steps because it has experience in setting up businesses; furthermore, they most certainly starting a company based on a business idea previously gestated in their previous ventures. The moment they will ask for support is when their knowledge is not enough to solve a new, complex and serious problem. As

suggested above, the BI might not have the ability to help tenants solve this kind of problems.

We found support for size of companies having a positive impact in solving problems. This confirms previous work on capabilities development (Zahra, Sapienza, & Davidsson, 2006) suggesting that size of companies is determinant to use problem solving as a way to develop and build capabilities.

5.6.1 Limitations and further research

This study is not without limitations. Our study only surveyed companies within their incubation period. Therefore, we are not capable of providing evidence of two further groups of companies: failed businesses and graduates. Business failure can be attributed to a myriad of factors such as finance (Everett & Watson, 1998), marketing (Sharma & Mahajan, 1980), or lack of managerial skills (Penrose, 1959; Thompson & Wright, 2005). BIs often boast higher rates of success among their graduates (e.g. EC, 2002) which lead us to assume that the BI intervention is seldom the main cause of firm failure. Bias towards s positive BI intervention is therefore unlikely to be present. Furthermore, our research design meant to capture tenant firm level problem solving processes during a limited time of their incubation period. Alternative designs to ameliorate this bias would now have to include retrospective data which could, in turn, raise further issues. Finally, we did not enquired on the complexity of each problem. This can bias BIs' intervention reducing its importance given that the more complex the problem, the more likely that firms seek support in several sources or take longer to solve the problem.

This study opens many promising future avenues for research. Further studies can focus on disentangling even deeper the complex relationships between experiencing problems, providing support and solving those same problems. As Nickerson and Zenger (2004) suggest, problems have different degrees of complexity and, as a result, solved problems will not have the same impact in the firms capability pool (Nickerson & Zenger, 2004, p. 628). Complexity of problems might be related to different orders of capabilities (cf. Winter, 2003). The complexity of the problem

also implies different governance modes to improve the chances of finding a solution. One possible way of improving of knowledge of the incubation process would be to use more specific and complex problems (or sets of problems) as unit of analysis and map their solution quest in real time. Future research should also try to uncover what might be the role of the BI in helping tenants when the solution is searched internally. Arguably, even when managers choose to find a solution internally, BIs can still have a role in facilitating this process.

If taken together, the findings about age and human capital suggests an important research agenda. If older and more experienced tenants solve less problems this suggests the BI intervention to be deficient to some extent. In other words, the negative coefficient of human capital suggests that BI admit tenants who are experienced enough to be less likely to seek support and whey they do, the BI is not capable of supporting them. The same happens with age: BI are currently allowing tenants to develop enough capabilities while in the incubation period till they reach an expertise in which they do not and cannot profit from the BI's support. Future research should investigate the value of support against the backdrop of both BI's and tenant firm's capabilities pool.

5.7 Conclusions and Implications

In sum, our results represent an advance to BI literature. While prior studies provided almost no theoretical perspective to adequately measure BI performance, we showed that using knowledge base theory of the firm insights together with RBV and organizational capabilities thinking yield important considerations. Furthermore, by choosing tenants' problems as unit of analysis, we were able to measure the BIs' intervention in terms of amount of help provided to their tenants.

The major contribution of this study is to ascertain the value of the BIs' intervention in their tenants. Our results show that BIs indeed contribute to firm development by having a significant role in helping their tenants to solve their problems. However, the negative relationship found between age, human capital and amount of problems

solved suggests that the BIs' ability to help their tenants is limited. This would not be a shortcoming if the limit would always be beyond their tenants' needs.

Taken together, our results yield important implications for BI managers, prospective tenants and BI planning actors. BI managers are now more aware of how to help their tenants. Making resources such as infrastructure, business support and access to networks available is certainly valuable; however, it is by helping their tenants to solve their specific problems that the real value of being incubated lies. As a result, tenants will accelerate the process of creating of important routines and capabilities. Our results also point to the limit of the BIs' ability to help their tenants. BIs have two ways of making sure that no tenant is left without the needed assistance: a) assemble resources and develop internal capabilities to cope with tenants' more complex problems; or b) impose graduation policy based on goals instead of age of tenants. This will ensure that tenants' needs are more likely addressed. Prospective tenants are also now better informed about the value of incubation when starting their ventures. Entrepreneurs can enjoy valuable help to solve their developmental problems while always keeping ownership of the solution. Also, when choosing a BI, prospective tenants should look at what resources are available within the BI but most importantly at how they are used to help young firms. Finally, BI planning actors such as universities, regional authorities or corporations gain better insights on how and what to establish in terms of resources and capabilities when setting up a new BI. Our study points that finding a good balance between BI's resources and capabilities to be crucial for the effective help given to new firms.

5.8 References

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Chapter 6

Discussion and Conclusion

6.1 Introduction

The main objective of this thesis is to investigate which characteristics of BIs determine the impact BIs have on incubated companies' development. We started by looking at the BIs' technology mission and founding period (generation). Next, we focused on the internal dynamics of providing support to tenants examining the levels of support delivered to tenants through problem solving. This chapter combines all results of the previous chapters and discusses the theoretical contributions and managerial implications of the whole document. Finally, we suggest several avenues for further research on BIs.

6.2 Research Findings

Table 6.1 summarizes the research results of the previous chapters. Our first study (Chapter 2) advanced the notion of different generations of BIs according to their foundation date. We offered the working hypothesis that each generation of BIs added one dimension to their service portfolio. The third and most recent BI generation delivers support along three dimensions: infrastructure, business support and access to networks. This first study focused on analysing the differences between the three generations of BIs. We showed that:

- Different generations of BIs offer currently the same portfolio to tenants;
- Tenants make different use of the service portfolio across BIs' generations;
- Selection criteria and exit policies affect the incubatees' use of services.

The results from this initial study suggest a relationship between the founding date of BIs and some of their management practices, namely selection criteria and exit policies. Third generation BIs select the youngest tenants and promote the highest turnover of tenants when compared to the remainder generations. This ensures a bigger share of tenants using the service portfolio. Conversely, first and second generation BIs select older tenants and, as a result, provide fewer companies with services beyond infrastructure.

Our second study analyzed the service provision of technology based BI (TI) compared to the non technology business incubators (NTBI). Management practices such as tenant selection and exit policy were also part of this study. We see that:

- TIs provide a bigger share of tenants with services;
- TIs have stricter selection criteria and enforce an exit policy;
- TIs tenants grow faster than their NTBIs counterparts.

This piece of research concurs with the first one exposing the potential mismatch between the service portfolio and the population of tenants. Also, we advance that the strategic positing of the BI towards incubating technology based ventures influences the incubator's effectiveness to the extent that it provides fewer companies with services. Finally, we suggest that TIs house faster growing companies that NTBIs as a result of their more intensive service delivery.

Our third study analyzed where tenants companies look for support when they experience problems. We compiled a list of problems in four distinct fields: strategy, economic, management and networks. This paper shows that:

- Incubated companies report experiencing about half the problems listed;
- Support within the incubator is not necessarily sought when problems are experienced;
- Business incubators' support is mostly helping tenants solving strategic problems.

This chapter shows that the role of BIs in promoting company development might be limited. Further, we find that BIs' support is more sought in strategic problems and that this might be a result of a shortage of support for this kind of problem elsewhere.

Finally, in our fourth study we analyze the role of BIs in helping incubated companies developing by helping them to solve developmental problems. We extended the problem-solution framework into a model crafting hypotheses about

the determinants of looking for support and the impact of support in finding solutions. Age, human capital and size of firm were used as control variables. The results of this paper show that:

- Incubatees always seek support after experiencing problems;
- Solving problems is not exclusively done with the support of the BI;
- The abilities of BIs to help solving problems are reduced as the incubatee develops.

These results show that companies experiencing problems seek for help regardless of their age or the entrepreneurs' experience. Further, we add to the previous conclusion that the role of the BI might be limited for two reasons. First, tenants firms solve their development problem using support from the BI as well as support found outside the BI's environment. Second, older incubatees show few problems solved even after they receive support from the BI. We now turn our attention to discuss these results when taken together.

Table 6.1 – Overview of research findings and contributions.

Paper	**Research Question**	**Data & Methods**	**Results**	**Implications**
Chapter 2 An Assessment of Evolving Business Incubators' Value Proposition	What are the differences between the value propositions across generations of BIs? Is the BI value proposition across generation arising from industry standards or developed to cater for tenants' needs?	7 BI = 2 Gen I + 2 Gen II + 3 Gen III 71 tenants = 25 Gen I + 19 Gen II + 27 Gen III Survey + Interviews + Secondary data	Although BIs provide the same service portfolio across generations, tenants in the older generations make less use of the incubator's service portfolio. Older BI generations' tenants are also recruited older and stay longer in the BI.	There is a link between the tenants making use of the available value proposition and the tenants' profile. This is related to BI management practices such as selection criteria and exit policy.
Chapter 3 Are Technology Business Incubators Different? An Examination of Service Portfolios And Selection Strategies?	What are the differences between TIs and Non Technology BIs in terms of service provision to tenants and tenants' characteristics?	12 BIs = 7 TIs and 5 NTBIs 101 tenants = 50 TIs and 51 NTBIs Survey + Interviews + Secondary data	TIs provide more tenants with services apart from infrastructure. TIs select younger companies and attract more experienced entrepreneurs.	TIs support more tenants while recruiting the adequate companies to incubate. As a result, TIs' incubated firm show greater growth during the incubation period.

Paper	Research Question	Data & Methods	Results	Implications
Chapter 4 Business Support Within Business Incubators	Where do BI tenants look for support and which sources are more effective?	12 BIs 101 tenants Partial correlation analysis	Support for solving problems is not necessarily sought, even less within the incubator. Support provided by the BI contributes solve mainly strategic problems.	These results point to a mismatch between the BI services and the tenants' needs. However, BIs might be the only source of support for nascent companies in terms of strategy.
Chapter 5 The role of BIs in facilitating firm development	Are BIs contributing to tenants' development by helping to solve their development problems?	12BIs 73 tenants OLS regression	Tenants seek support when they experience a problem independently from their age, human capital levels and size. Tenants solve problems when supported by the BI as well as y their own network.	The BIs' ability to help their tenants is limited. BIs' are most likely not able to help tenants to solve every problem, at any stage of their development.

6.3 Theoretical Contributions and Implications

This thesis contributes in several ways to the current debate about the impact of BI on tenants firms. First, we advance BI measurement techniques developing two distinct methods of evaluating firm level differences of incubation intensity. Second, we relate the service delivery to tenants with management practices such as selecting criteria and exit policy. We show that these management practices determine the levels of service provision within a BI. Third, we provide evidence that the BIs' abilities to incubate companies are limited. Taken together, these results have several practical implications for BI managers, prospective incubator tenants and policy makers.

6.3.1 Measuring incubation outcomes

Measuring BI outcomes has long been recognized as one of the greatest challenges of BI research (see for example Sherman & Chappell, 1998). Both our operationalizations constitute an initial step to measure BI effectiveness to the extent that we contribute with novel measures to differentiate the amount of support each tenant company receives. While we are not directly researching the firm-level long term impacts of the incubation period, we provide a measurement instrument that can be used in different research designs. We show that it is possible to measure BI using two distinct streams of literature: i) resource-based view of the firm (RBV) and ii) dynamic capabilities and learning literature.

The RBV has been widely used in strategy and management studies in the past two decades. It postulates that firms gain competitive advantages when detaining resources which are valuable, rare, inimitable and non-substitutable (VRIN) (Barney, 1991, 2001). The BIs' sheltered environment supporting companies from inception and accelerating their learning curve can be seen as VRIN resources and therefore contribute to superior firm performance. The notion that VRIN resources can be developed since a firm's earlier stages has been advanced previously (Brush, Greene, & Hart, 2001) as well as the fact that entrepreneurs using multiple sources

and partners to shape their ideas and develop their companies (Greve & Salaff, 2003). We used these two insights as an overarching theoretical framework and subsequently derived a list of services that BIs should provide their tenants. BIs provide services along three main lines: infrastructure, business support and access to networks.

We also showed that incubation can be measured and operationalized based on the dynamic capabilities literature. An extension of RBV thinking postulates that dynamic capabilities lie at the heart of firm's competitive advantage. Dynamic capabilities are "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano, & Shuen, 1997, p. 516). Learning has been suggested to be the chief mechanism for firms to create dynamic capabilities (Zollo & Winter, 2002) and, more particularly, the mechanism of problem solving (Nickerson & Zenger, 2004). We use this insight to derive a list of developmental problems new firms typically have to face. We further borrowed from social networks literature the notion of four fundamental areas of firm development (Groen, Wakkee, & De Weerd-Nederhof, 2008; cf. Parsons, 1964) to establish a list of typical problems a nascent firm faces.

Our empirical approach advances BI literature for several reasons. First, operationalizations of incubation centred on the tenants allow for different BIs categorizations. Literature on BIs often concentrates the empirical evidence on the supply side, that is, the incubator. It follows that typologies and categories derive mainly from BIs characteristics such as service availability (Grimaldi & Grandi, 2005), institutional strategy (Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005) or geographic competitive scope (Carayannis & von Zedtwitz, 2005). All these characteristics are more related to the BI setting that to its operation. Also, the service portfolio, institutional strategy and competitive scope are not dependant on the tenants and might have little impact on the resulting population of tenants. Previous research alerted for the need of analyzing both BI set-up and operative characteristics to better understand BIs (Ratinho & Henriques, 2010). We show that measuring incubation focusing on tenants' levels of service usage yields different

results than those obtained when focusing exclusively on BI's characteristics. For instance, some of the BIs in our sample could be dubbed University BIs for operating as not-for-profit and with a clear mission of attracting people in a given geographical region (Carayannis & von Zedtwitz, 2005). This means that their service profile should have a strong scientific background and strong links to a university and science (von Zedtwitz & Grimaldi, 2006). While this might still be true for some BIs, the impacts of these settings would be hardly visible if those University BIs were providing a small share of their tenants with services. The same can be said about problem solving: no typology is meaningful if BIs do not provide any help to tenants in the form of supporting developmental problem solving.

Second, by looking specifically at tenants' profile we observed heterogeneity within each BI. This means that not all tenants within the same BIs are looking for the same levels of support; this might be a result of their different age, experience or development stage. The logical consequence is that the levels of support actually delivered by the BI are also different which results is different intensities of incubation across a given BI's tenant population. Although it may seem trivial, contemporary BI literature overlooks this idea and most studies assume that BIs support is homogeneous across tenants and remains unchanged throughout the incubation years (e.g. Amezcua, 2010; Schwartz, 2009). We show empirically that some tenants within the same BI are receiving more support than others either in the number of services used or in the amount of problems for which support is sought and obtained. Theoretically, this allows for different considerations when designing research using performance measures as a dependent variable (e.g. survival, turnover or firm growth). Studies in this vein should distinguish between graduate tenant firms which received more support than other that enjoyed few services beyond infrastructure. Finally, operationalizing incubation as support given to tenants permits testing hypotheses directly related to the tenants' characteristics. For instance, Chapters 2 and 3 showed how tenant characteristics determine the service usage levels.

6.3.2 Mismatched service portfolios and inadequate screening practices

The observed differences between the BIs' service portfolio and the tenants' levels of usage suggest a mismatch between what BIs offer and their tenants' needs. We saw that there is a generational effect, that is, older generation BIs provide fewer tenants with services. For instance, only about a third of second generation BIs' tenants make use of coaching services while this figure is close to 100% in third generation BIs (see Table 2.4). Further, our results from Chapter 3 also suggest that BIs focused on incubating technology-based firms are more likely to provide a bigger share of tenants with a complete portfolio (see Table 3.3). We interpret this as a mismatch of BIs service portfolios, that is, tenants do not make use of available services because those are not adequate to their needs. Yet a low share of usage does not necessarily mean a complete absence of those services in the BIs' service portfolio.

Allen (1988) suggests that each BI evolves from an initial phase, during which management focuses exclusively on providing infrastructure services, to a fully-fledged service portfolio including business support and networking services. Our findings on the BI side seem to confirm this as BIs founded in disparate points in time are presently delivering the similar service portfolios. The BIs in our sample were also old enough at the time of research to have evolved through all Allen's phases. Yet our results point at differences in the service delivery across generations when tenants are enquired. These differences do not mean that the services are entirely not present but rather provide evidence that not all tenants use those. The implication of these results is that although BIs updated their service portfolio, the tenant population does not need those services. This finding develops further Allen's insights on the evolution of BIs (1988) showing that even if each BIs evolves from infrastructure to network services, older generation BIs never fully provide the newer services to a significant portion of their tenants. We argue that this is a consequence of poor selection criteria and the lack of a clear exit policy, as visible in the entry and current age of tenants.

Similar results are evident also in the case of TIs. TIs are able to provide a bigger share of their tenants with more services and this is correlated to selection criteria and exit policy. These results confirm Schwartz and Hornych's insight (2008) that there seems to exist a better offer of business support services within specialized BIs. Also, previous work discusses the value of specialization (Aerts, Matthyssens, & Vandenbempt, 2007; Hansen, Chesbrough, Nohria, & Sull, 2000) and suggests that some resources are only profitable for the BI to provide if tenants belong to the same technological field (Chan & Lau, 2005). Our results show that NTBIs provide significantly fewer tenants with services while selecting also older and bigger companies. As in the case of BI generation, the mismatched service portfolios are a reflection of different selection criteria and exit policy and the resulting tenant profiles.

Selection criteria and exit policy are important management features of every BI (Aerts, Matthyssens, & Vandenbempt, 2007; Lumpkin & Ireland, 1988). BI literature has already related selection practices to tenants survival (Aerts, Matthyssens, & Vandenbempt, 2007) as well as service profile delivery to BIs' mission (von Zedtwitz & Grimaldi, 2006). Yet individual level service provision was never considered to be dependent on tenants' characteristics. McAdam and McAdam (2008) alert to the fact that some services are valued differently by the same tenant throughout their incubation period. For instance, younger firms perceive a credibility gain when accepted to the BI while some time later feel that being located within a BI suggests vulnerability and inexperience to potential costumers (McAdam & McAdam, 2008, p. 288). We extend McAdam and McAdam's insight (2008) showing that the some companies might not even enjoy any of the services delivered by the BI beyond infrastructure. Our data shows that older generation BIs in fact accept five year old companies (see Table 2.5); also, NTBIs in our sample select three year old tenant companies, on average (see Table 3.4). This is the source of the low shares of tenants enjoying BI services and limits the BI's intervention.

6.3.3 BI's abilities are limited

Our results from Chapters 4 and 5 suggest that BIs' abilities to help tenant to develop are limited. For instance, in Chapter 4 we see that tenants seek BI's support mostly for strategy problems. It is also visible that strategy problems are the ones that are more likely to be solved after help is sought. Chapter 5, in its turn, shows that BIs are not the only ones helping effectively tenants to solve problems; tenants also recur to their own network of contacts to seek help and solve problems. There are some studies casting doubts about the impacts of business support mechanisms. For instance, Robson and Bennet (2000) found that private sources of support such as lawyers, suppliers and friends/relative have the most significant impact on firm performance (p. 204). Note that these sources of support are not providing specific help to problems related to firm development. Our findings show that the lack of impact of BIs' services on firm performance might be related to the BIs' lack of ability to help tenants solving problems. This means that although the BIs establish comprehensive service portfolios, service delivery might not be the most adequate, as the individual analysis of the problem solving patterns suggests.

One common assumption in BI literature is that incubators help creating a community of entrepreneurs, rich in interaction and business-related relationships among tenants. For instance, Honig and Karlsson (2010) show the importance of belonging to a community and suggest the importance of BI managers in playing a facilitating role in managing that community. Tötterman and Sten (2005) findings are similar and go further in describing the loyalty of incubated firms to their community. Our findings show that tenant interaction does not seem to be a form of business support: support sought next to fellow tenants is very rare (see Table 4.4) as well as the value of this kind of support for solving problems (see Table 5.3). This means that while BIs do not contribute significantly to the formation of dense social networks, they are accepting tenants who already possess bigger networks.

6.3.4 Are Business Incubators Helping?

The answer to the title of this thesis is not straightforward. Our findings point to the fact that BIs may indeed be helping when they select adequate tenants and are specialized in technology-based firms. Third generation BIs (Chapter 2) and TIs (Chapter 3) are in fact providing more services to tenants and therefore likely to deliver more help to incubated firms. This symbiotic relationship between the tenant portfolio and service delivery suggests that BI management practices have a crucial role in the impact incubation can have on firm development. While this may not seem apparent, it follows that BI managers choose whether to help or not incubated companies and do so through tenants portfolio management (selection criteria and exit policy). This logic is more visible using the competing value framework for assessing organizational effectiveness.

Competing values within Business Incubators

Previous work identified institutional pressures on BIs to be simultaneously incubating new technology based firms, contributing to job creation and generate profits (OECD, 1997; Ratinho & Henriques, 2010). These goals might not be entirely compatible. Yet BIs' management boards include regional authorities, universities and private investors representatives seeking to harmonize antagonistic goals in one organization (see, for instance, Chapter 2 for a description of our cases; OECD, 1997; 1999). Each of those stakeholders have competing values which clearly impact the BI's effectiveness (Quinn & Rohrbaugh, 1981; 1983) in delivering support to companies. This is visible in both our lines of reasoning, i.e., measuring the availability of services across BIs and using the problem solving framework on the incubated company level.

Our results show that a significant number of BIs is not delivering support to their tenants. Those are mainly what we dub first and second generation BIs characterized by older, bigger and relocated tenants staying longer periods within the BI. The revealed selection criteria are therefore tenants who are able to pay rent and pose a lesser risk for the BI in terms of financial stability. In fact, one of our BI

cases demands the firm's yearly balance and solvability before acceptance (Chapter 2). This may be a result of competing values between shareholders of those BIs.

For instance, universities are well aware of the uncertainty associated with research and development outcomes; lead times are particularly long in sectors of activity such as biotechnology or pharmaceutical; this translates in nascent companies focused on research and development and not necessarily trading. Private investors seeking profits and return on investment, as well as regional authorities concerned with job creation, might not be willing to accept such companies within BIs since there is a greater risk that they are not able to pay rent. In Chapter 2 and Chapter 3, we see that the majority of BIs categorized as first and second generation, and non-technology focused are for-profit and not closely linked to universities.

This lack of support delivery raises a problem of legitimacy for BIs. First and second generation, and non-technology based BIs show tenant portfolios solely composed of companies which can generate enough turnover to pay rent. This is contradictory to their espoused mission and, in the long run, does not satisfy any of the shareholders.

BIs gain from taking a more sensible and modest approach when establishing their business support portfolios to ensure support is in fact delivered to incubated companies. That is, business support services should be tailored to tenants' needs but more focused on specific areas of problems. What makes a firm unique is a long standing question in the field of management and our understanding about this still limited. Therefore, BI critics see strangely initiatives that claim having comprehensive solutions for creating companies with unique sets of capabilities to survive and grow bigger. One theoretical argument against incubation would be that capabilities emerge internally in the firm but competitive advantage is achieved when form develop dynamic capabilities (Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 1997). Yet these dynamic capabilities are only exercised against an environmental backdrop, that is, firm react to contingencies and environmental changes. If located within a BI – a sheltered community of nascent firms – firms

may never develop important capabilities to survive after graduation. Further, the initial steps of a company might not be related at all with its subsequent development. A very similar formulation has been articulated by Gibrat and it is known in literature as the Gibrat's law: firm growth is independent from firm size (Sutton, 1997).

Theoretical advancements on BI can profit from an analogy with a medical incubator: helping premature born children contributes to their survival but it would be hard to relate that help to being awarded a Nobel Prize. This means that BIs would profit from helping companies to survive their hardest years and assisting them in overcoming their liabilities of newness. BIs' intervention should be centred in intervening in the initial phases of a company and focused on solving their most immediate needs during those phases. The next section will provide some practical prescriptive implications based on these theoretical contributions.

6.4 Practical Implications

Although the main target audience of this thesis is the community of entrepreneurship scholars, we believe we have some useful practical implications for BIs managers as well as prospective tenants and policy makers.

BI managers

Understanding the relationship between selecting, managing the tenant population and the business service portfolio is essential for BI managers. Services provided must match with tenants need and therefore adequate procedures of selecting and graduating companies should be established. Further, the more heterogeneity BI managers allow in terms of age, phase of development or sector of activity, the more diverse the services should be. This translates in more expertise to cater for all tenants' needs or failing to meet tenants' needs.

The initial BIs were established taking advantage of economies of scale emerging from renting small office to start-up companies (Chapter 2). In fact, the basic principle of agglomerating nascent companies under one roof is to provide services

(in all dimensions) that would be unaffordable for firms but also scalable. That is, the marginal costs of a given service must decrease with more firms using it (Panzar & Willig, 1977). Throughout the evolution of BI models, different dimensions of incubation were introduced (business support and networks) but seemingly the scale effect was disregarded. Scale effects reduce costs of a given service but selection criteria must guarantee that tenants are likely to use a given service.

Prospective tenants

Prospective tenants can also profit from our results. Companies willing to be accepted in a BI should look also at their future tenants as means to understand the service portfolio. In Chapters 2 and 3 we showed that BIs tend to standardize their value proposition and claim providing approximately the same service portfolio. Yet when looking at the share of tenant using those, the picture is very different. For instance, a technology based company should look forward to being accepted in a TI since the services are more specialized. In the same way, a company looking for a vibrant and dynamic environment should look for a third generation BI since there will be younger companies more likely to enjoy business support services.

Policy makers

We also inform policy makers about making a clear distinction of concepts, raising awareness for the need to match the service portfolio to tenants' needs, keep a technology focus and ensure that the adequate firms are incubated. Our results show that there are several ways of categorizing BI. Our categories are novel to the extent that they are based in tenants' characteristics and defined by levels or service provision. Policy makers have the ability to shape the environment through their decision. As such, the choice of which BIs to subsidize, allocating resources to modernize business services portfolio and supporting new business development project are in their decisions' scope.

We suggest that funds should be allocated to support third generation technology-based BIs, that is, those with a comprehensive service portfolio. Appropriate selection criteria and exit policy should be enforced making sure that a clear

majority of the tenants will profit from them. This priority implies that BIs should only receive public support when incorporating in their missions a clear mission to incubate technology based companies, established a service portfolio and, more importantly, provide evidence of their functioning. Our results show that some BIs upgrade their service portfolio while maintaining the same tenants or selecting those that might not make use of the while service portfolio. Therefore, our recommendations go beyond prescribing BIs' characteristics and suggest close monitoring. This would keep first and second generation BIs to be mainly infrastructure providers.

Monitoring is also crucial for assessing BIs performance and effectiveness. BIs frequently self report the total number of graduates as proxy for their own performance (e.g. Knopp, 2007). We observed that some categories of BIs provide few tenant companies with services (older generation and NTBIs). This means that using only the number of graduates as proxy for performance disregards the fact that some tenants might not have had any support beyond infrastructure. BI managers have the ability to shape and control their tenant portfolio to make sure that the BI intervenes and contribute to the future of their tenants companies.

6.5 Limitations and Further Research

This thesis is not without limitations. We acknowledge that we worked with a small number of BIs when compared to the universe of BIs. Further, within each BIs we analysed a small portion of tenants. This is common constraint in BI research. Most studies report scarcity of data (e.g. Salvador, 2010; Zhang, 2009), use project-based collaboration to collect data (e.g. Carayannis & von Zedtwitz, 2005; von Zedtwitz & Grimaldi, 2006) or devise case studies in geographically close BIs (Patton, Warren, & Bream, 2009). We tried to ameliorate this by changing the level of analysis and grouping BIs. Chapter 2 analyses generations while Chapter 3 focuses on TIs and NTBIs. We believe therefore that our results provide a good contribution to the understanding of these categories of BIs. Further, Chapters 4 and 5 analyze on the dynamics of support taking every tenant together.

The data used in this thesis is cross sectional in nature. Although Chapter 4 and 5 asked tenants about the help they had been receiving since entry in their respective BI, this can be considered as cross sectional since it refers to just one period in time. However, since tenants of every generation and both types of BIs were, at the time of research, were at the BI for at least three years, this implies that data on problem solving and service usage is without bias. That is, it would be difficult for tenants located for that long within their respective BI to not have needed or used the service portfolio or experience any developmental problem. Hence, we contend that the cross-sectional nature of our data is not a significant source of bias.

We identify two main avenues for further research. First, future studies should investigate in more detail what happens to companies after graduation. Our results show that BIs have a role in solving problems but it is yet to be researched if that help in fact translates in the creation of capabilities (cf. Nickerson & Zenger, 2004). This calls for a longitudinal research design in which the impacts of each BI intervention would be monitored and analysed. Second, a better understanding of the modes of providing each business service would be welcomed in BI literature. For instance, the BIs in our sample provided coaching to their tenants. Yet there are several ways of providing this service which can, in turn, have an effect in its efficacy. Also, the frequency and intensity of provision might help to better understand the impact of the incubator's intervention in companies.

BIs provide an extraordinary empirical setting to investigate nascent firms. Within the BI, it is possible for researchers to follow the entrepreneurs' idea, mapping the exploitation stages, accompany the unfolding of the entrepreneurial process till the first sale and look closely at what happens during the first trading years of companies. This means that BIs can almost work as laboratories for management researchers facilitating the observation of a range of phenomena related to entrepreneurship such as ideation, capability development, social networks, opportunity recognition among others.

6.6 Conclusion

Our main research question set out to determine which BIs characteristics can contribute better to tenants' development. The results show that the most recent generation of BIs as well as BIs with a clear mission on incubating technology-based companies provide a bigger share of companies with services. This means that these types of BIs have a more thorough intervention in tenant companies and can therefore contribute better to their tenants' development. However, the fundamental difference between these types of BIs and the remainder is the selection criteria and exit policy. Third generation and technology focused BIs selected younger tenants and do not allow them to stay more than three years on average within the BI.

6.7 References

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Appendix A

NENSI Questionnaire to Tenants - Summary

Section 1: Enterprise characteristics

1. What is the name and address of your enterprise?
2. In which year was your enterprise established as a legal entity?
3. In which sector does your enterprise operate? (NACE code)
4. What is the total number of current employees (FTE)?
5. Check if the following items describe your enterprise. Check all boxes that apply

   Main part of our product is R&D for others

   Privately held

   Sales and marketing firm

   Mainly an importer

   Not-for-profit organization

   Mainly a distributor

   Mainly a manufacturer
6. What is your primary product or service?

Section 2: Entrepreneurs' characteristics

7. Is the enterprise established by a team of entrepreneurs? (Yes/No)
8. What is the age of the entrepreneur(s)? (optional)
9. Did you own any other business prior to this current enterprise?
10. Prior to going into business on your own account, how many years were you employed by others?
11. Did you or anyone from the entrepreneurs team had any specific entrepreneurship training ?

Section 3: Relation with the incubator center

12. In which year did you move to the Incubator center?
13. What did you feel the degree of difficulty to be allowed entry into the Incubator center? (5-point Likert scale)

    When are you leaving the incubator center? (Approx. XXX.months from now; I want to stay as long as possible; Do not know yet)

Section 4: Enterprise development and business support

14. Since the beginning of your incubation period, to what extent did you experience any of the following problems?

Problem description	**No problem - Very serious**				
Obtain finance	1	2	3	4	5
Accelerate time to market for products/services	1	2	3	4	5
Build/expand your market base	1	2	3	4	5
Professionalise management	1	2	3	4	5
Save on equipment costs	1	2	3	4	5
Hire personnel	1	2	3	4	5
Comply with administrative regulations	1	2	3	4	5
Ally with enterprises	1	2	3	4	5
Get advantage over competitors	1	2	3	4	5
Improve cash-flow	1	2	3	4	5
Introduce new products or services	1	2	3	4	5
Increase credibility	1	2	3	4	5
Get external advice	1	2	3	4	5
Write and present a business plan	1	2	3	4	5
Save on labour costs	1	2	3	4	5
Increase entrepreneurial skills	1	2	3	4	5
Establish contacts with suppliers	1	2	3	4	5
Introduce/Develop new technology	1	2	3	4	5
Find office/production space	1	2	3	4	5
Generate new business ideas	1	2	3	4	5

15. Did you look for support for any of the problems experienced? If so, where did you look for support? Please tick all applicable.

Problem description	**No support sought**	**Incubator**	**Fellow tenants**	**Directly outside**
Obtain finance				
Accelerate time to market for products/services				
Build/expand your market base				
Professionalise management				
Save on equipment costs				
Hire personnel				
Comply with administrative regulations				
Ally with enterprises				
Get advantage over competitors				
Improve cash-flow				
Introduce new products or services				
Increase credibility				
Get external advice				
Write and present a business plan				
Save on labour costs				
Increase entrepreneurial skills				
Establish contacts with suppliers				
Introduce/Develop new technology				
Find office/production space				
Generate new business ideas				

16. Did you solve the problem you experienced?

Problem description	**Yes**	**No**
Obtain finance		
Accelerate time to market for products/services		
Build/expand your market base		
Professionalise management		
Save on equipment costs		
Hire personnel		
Comply with administrative regulations		
Ally with enterprises		
Get advantage over competitors		
Improve cash-flow		
Introduce new products or services		
Increase credibility		
Get external advice		
Write and present a business plan		
Save on labour costs		
Increase entrepreneurial skills		
Establish contacts with suppliers		
Introduce/Develop new technology		
Find office/production space		
Generate new business ideas		

17. Did you use any of the services listed below?

Service	**Yes**	**No**
Infrastructure		
Space		
Shared resources		
Business support		
Internal coaching		
BP support		
Training		
Direct subsidies		
Access to networks		
External coaching		
Brokerage		
Seed/venture capital		

Summary

Are They Helping? An Examination of Business Incubators' Impact on Tenant Firms

Business incubators (BI) have been established throughout the world as spurs to economic growth. Promoters and BIs' managers claim an important role in creating companies, support them till graduation and therefore often boast their contribution to job and wealth creation. Particularly since the 1980s, policy makers have been endorsing BIs among other infrastructure to stimulate or regenerate regional economies. Yet academic research has not been able to ascertain any of the above mentioned impacts. The reason behind this might be the lack of an appropriate theoretical background combined with the descriptive nature of most studies.

This thesis sheds light on the role of BIs in helping tenants. We will analyze how BIs are providing services to their tenants, delving into the mechanisms of business support delivery. We provide a fresh insight on BI research discussing the theoretical foundations of the concept of incubation anchored in three main streams of literature: economies of scale, learning and network theory. The focus is on the internal operation of the BI, tackling levels of analysis such as the firm and the incubator.

In Chapter 1, we introduce the topic of business incubation and the research motivation. A brief review of academic literature shows which areas are under-researched and gauges our research questions. The empirical data used for the book is also described here as well as the thesis structure.

Chapter 2 deals with the evolution of business incubators. We look at seven European incubators and confirm the existence of generations defined by the foundation date of each incubator. The differences are visible in the service provisions level, in the selection criteria and exit policy. We suggest these features

are related: the characteristics of the tenant population, such as age or size, impact the tenants' needs for incubation services.

Technology based business incubators (TI) are the central theme of Chapter 3. Here, we analyze 12 business incubators comparing the service level provision of this type of incubators to non-technology based business incubators (NTBI). Results show that TI intervene much more on their tenants to the extent that they provide more services. Also, the selection criteria and exit policy of TIs are more related to the goals of incubating nascent ventures.

Chapter 4 introduces the problem solution framework to investigate the question of where incubated companies go for business support. Contrary to our expectations, tenant companies do not always rely on business support coming from the incubator and, when they do, this support is not always effective.

Finally, Chapter 5 uses the problem solution framework to research what are the determinants for incubated companies to seek support. We see that although support is sought whenever problems are experienced, those are not solved exclusively with the support of the business incubator.

Taken together, our results show that BI can have an impact on their tenants' development if established and managed properly. A clear strategic focus and well defined selection criteria are critical to the good functioning of the BI. Further, a close contact with tenants, facilitating their development by providing a balanced portfolio of services promotes a healthier future for incubated companies.

Samenvatting

Helpen ze? Een onderzoek naar de invloed van Business Incubatiecentra op Tenant bedrijven

Business incubators (BI's) zijn over de hele wereld opgericht als aanjagers van economische groei. Promotors en managers van BI's maken daarbij aanspraak op het feit dat ze een belangrijke rol hebben in de oprichting van deze bedrijven, die ze begeleiden tot ze geslaagd zijn en daarom hoog op kunnen geven over hun bijdrage aan welvaart en het creëren van banen. In het bijzonder sinds de jaren '80 onderschrijven beleidsmakers onder andere de infrastructuur van BI's in het stimuleren of regenereren van lokale economieën. Academisch onderzoek heeft echter geen van voornoemde invloeden kunnen vaststellen. De reden hiervoor zou het gebrek aan een geschikte theoretische basis kunnen zijn in combinatie met de achtergrond van onderzoek op dit gebied, dat veelal beschrijvend is.

Dit proefschrift geeft inzicht in de rol die BI's hebben in het helpen van tenants. We analyseren hoe BI's services aanbieden aan hun tenants, en verdiepen ons daarbij in de mechanismen van deze bedrijfsondersteuning. We werpen een nieuwe blik op de theoretische basis van BI onderzoek waarbij we de rol van incubatiecentra binnen drie stromen in de literatuur waarin deze verankerd is, zijnde schaalvoordelen, leren en literatuur op het gebied van netwerken nader beschouwen. De focus is op de interne werking van de BI, waarbij analyses op onder andere bedrijfsniveau en Incubatorniveau worden meegenomen.

In hoofdstuk 1 introduceren we het onderwerp Business Incubatie en de motivatie voor dit onderzoek. Een kort overzicht van academische literatuur laat zien welke gebieden die minder intensief onderzocht zijn en ijkt onze onderzoeksvragen. De empirische data die voor de thesis gebruikt is en de structuur van het proefschrift worden daarbij ook beschreven.

Hoofdstuk 2 beschrijft de evolutie van Business Incubators. We kijken naar zeven Europese incubators en bevestigen het bestaan van generaties, gedefinieerd op basis van de oprichtingsdatum van elk van de incubators. Verschillen zijn verder zichtbaar op het niveau van dienstverlening, in de selectiecriteria en in het exit-beleid. Basis karakteristieken van de tenants, zoals leeftijd en omvang, bepalen daarbij de behoefte aan incubatie services.

Business incubators met een technische achtergrond (TI's) vormen het centrale thema van hoofdstuk 3. We analyseren 12 TI's waarbij we het niveau van bedrijfsondersteuning vergelijken met de ondersteuning van BI's zonder technische achtergrond. Onderzoeksresultaten laten zien dat TI's veel meer ingrijpen bij hun tenants waarbij ze meer service verlenen. Als we kijken naar selectiecriteria en exit-beleid van TI's dan blijken die meer gerelateerd te zijn aan de doelen van nieuwe beginnende bedrijven.

In hoofdstuk 4 wordt het probleemoplossend raamwerk geïntroduceerd, nodig om de vraag te onderzoeken waar incubated bedrijven naar toe gaan voor bedrijfsondersteuning . In tegenstelling tot onze verwachtingen blijkt dat tenant bedrijven niet altijd op bedrijfsondersteuning vertrouwen, en, als ze dat wel doen, deze ondersteuning niet altijd effectief is.

Als laatste wordt in hoofdstuk 5 het probleemoplossend raamwerk gebruikt om te onderzoeken welke determinanten incubated bedrijven gebruiken om ondersteuning te zoeken. We zien dat, alhoewel ondersteuning wordt gezocht op het moment dat problemen worden ervaren, deze niet worden opgelost door alleen de ondersteuning van de BI's.

Onze resultaten tezamen laten zien dat BI's een rol kunnen hebben ten aanzien van de ontwikkeling van de tenant, mits goed gemanaged. Een duidelijke strategische focus en goed gedefinieerde selectiecriteria zijn essentieel voor het goed functioneren van de BI's. Naast een uitgebalanceerd service portfolio bevordert een goed contact met de tenants een gezonde toekomst.

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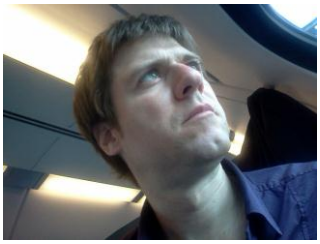
Resume



Tiago Ratinho was born in Portugal. He graduated in Industrial Production Engineering in the University of Évora (2002) and holds a MSc in Engineering Policy and Management of Technology from the Technical University of Lisbon (2007). Prior to the start of his academic career, Tiago worked as a Quality Management technician in Brazil and later as a Quality Management consultant to small and medium firms in Portugal.

Tiago joined Nikos – the Netherlands Institute for Knowledge Intensive Entrepreneurship of the University of Twente in February 2007 as a doctoral student under the supervision of Prof. Dr. Aard Groen. The research was embedded in an European wide effort to collect data on business incubators and their respective tenants. The results are presented here in this book.

Since 2007, Tiago has presented his work on incubators in several international conferences such as Babson College Research Entrepreneurship Conference, Academy of Management Annual Meeting and RENT-Research In Entrepreneurship & Small Business Annual Conference. Further, he has published one paper on Technovation and has three other pieces of research under review in international journals.

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