INCUBATION CENTERS: COMPARING THEIR SUPPORT PORTFOLIO AND THE ASSESSMENT OF TENANT COMPANIES

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ABSTRACT

Business incubators have been established around the world to spur economic development. Their basic functions are to nurture ventures in the same location and provide them with a mix of shared resources, business development services and access to professional networks. Most studies about business incubation describe an array of available services but often fail to present the tenants' assessment of the usage and quality of such service. We set out to investigate whether business incubation (supply) and tenants (demand) match in terms of business incubation services. Results show that while incubators claim to have similar support structures, tenants' usage often show the opposite. This is mostly dependant on the type of the incubation centers in terms of their generation and tenants' profile.

INTRODUCTION

There are over 900 business incubators (BI) within the European Union, a number showing a steep increase during the past decade (EC, 2002). This suggests a growing interest of policy makers in placing BIs as a central tool to support firm creation and development. In fact, practitioners and industry associations already claim to have such impacts in the overall economic fabric (NBIA, 2007; UKBI, 2007). There is, however, little systematic evidence of BI efficacy in promoting job and wealth creation (Massey et al., 1992; Quintas et al., 1992), university-industry interaction (Rothaermel and Thursby, 2005a, 2005b), innovation activity (Colombo and Delmastro, 2002), or firm performance. The reason behind this is the frequent lack of an adequate theoretical lens analyze BIs' activities (Hackett and Dilts, 2004). Furthermore, the plethora of models, different stakeholders and changing management practices existent in the universe of BIs provides an extra difficulty in investigating the nature of their performance (Phan et al., 2005).

The first BIs were established in the United States in the 1950s (Adkins, 2002). This first generation model, which became widespread during the 1970s, consisted mainly in providing shared space to young firms. The offices rented combined space and shared resources, such as reception, car parking, meeting rooms as well as the usual commodities. The underlying idea was to reduce costs to start-ups while at the same time profiting from the economies of scale arising from renting large office space building ready to use (Lalkaka and Bishop, 1996). This value proposition quickly evolved towards the end of the 1980s when lack of business expertise was acknowledge to be among the barrier to young firms' success. During the 1990s, the second generation of BIs often added to their value proposition business support services geared towards accelerating nascent firms' learning process (Lalkaka and Bishop, 1996). The most common business support services were training sessions and coaching, in some fashion. Recently, the value of the networks for young firms rooted in concepts such as social

capital triggered the third generation of BIs to include access to networks in their value proposition (Hansen et al., 2000). The idea is that the young firm can access valuable resources through the incubator network of contacts (Bøllingtoft and Ulhøi, 2005). Professional business services and access to venture capital are among the advantages of a valuable BI network.

Despite different incubation models and their evolution in last five decades, the landscape of today's BIs is apparently homogeneous. According to large scale studies (e.g. EC, 2002; Knopp, 2007) and practitioners definitions (NBIA, 2007; UKBI, 2007), BIs provide their tenants with approximately the same service portfolio. This suggests that older generations of BIs have been enlarging their portfolio of services to match that of newer generations. However, path dependencies of BIs or difficulty of shifting the incubation strategy might keep them from doing so. This triggered our first research question: Are there differences between the value propositions of each generation of BIs? Arguably, real differences between the value propositions of BIs would only be visible if assessed by tenants. Therefore, our second research question seeks to understand whether the value proposition of older generations of BIs is equally valuable to tenants.

We chose seven BIs distributed across six Northern European countries as our empirical setting. To answer our research questions, we surveyed both BIs and tenants seeking to compare the supply (BIs) and demand (incubatees) sides of incubation in terms of service provision. We examine the value proposition of BIs by looking at what they have available for tenants. Further, we investigate service provision by enquiring tenants on which services they use. This allows comparison between supply and demand of business incubation.

This article is organized as follows. We start by reviewing literature on BI searching for a common definition while also exploring their evolutionary path. Next, we describe the typical BI dimensions in which the incubation process takes place. At the same time, we discuss the theoretical arguments that provide the rationale for the value proposition of BIs. We present the results in section 0 and 0 organized according to the supply and demand sides of BIs. Discussion and conclusion finish the paper with a discussion of the results, limitations, future research as well as managerial and policy implications.

LITERATURE REVIEW

Definitions and the evolution of business incubation models

There are no universally accepted definitions for BIs. Definitions proposed for BIs do not focus conspicuously on physical space, but rather emphasize the effective combination of support services. Such services may include physical premises for incubated firms as the key defining feature. Yet incubation is much more than providing a key-in-hand office and shared building services (Aernoudt, 2004). Literature suggests business incubation to have several dimensions such as space, shared resources, business support, access to networks (e.g. Barrow, 2001; Smilor and Gill, 1986). Table 1 provides an overview of different definitions of business incubation (EC, 2002; NBIA, 2007; OECD, 1997; UKBI, 2007). These definitions share two key communalities related to the objective of BIs and the support portfolio they offer to tenant companies. First, BIs are focused on providing support to new start-ups with the goal to generate self-sustaining, successful companies. These organizations, in turn, contribute to the creation of economic growth and regional development. Second, BIs offer three types of support to nurture and grow start-ups: physical infrastructure, business support service and access to external resources.

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The concept of business incubation has been evolving since the 1970s, when initially emerged among other small enterprise support initiatives (Lalkaka and Bishop, 1996). The literature distinguishes between three generations of BIs, characterized by a shift from a focus on real estate to an emphasis on nurturing and growing start-up companies (Aerts et al., 2007). The first generation of BIs offered affordable office space and shared administrative services (Barrow, 2001; Lalkaka and Bishop, 1996). This can be labeled as the basic function common among all BIs (Allen and McCluskey, 1990). During the 1980s, governments in Europe and the US were confronted 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 direct 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 administrative services. Lack

of financial means, business experience and marketing skills were generally accepted as key barriers for new, technology-intensive companies. New BIs started gradually to include these services enlarging thus their value proposition. There was also a strategy shift to the extent that BIs started to invest more time and resources in actively supporting the tenants with the aim to spur company growth. This second generation of BIs represented much more than just a physical arrangement for start-up companies. Gradually, a third generation of BIs emerged. Today's BIs differ in their value proposition compared to previous generations given their emphasis on a much broader service portfolio: consultancy, networking and access to venture capital (EC, 2002; Lalkaka and Bishop, 1996) are among the most common services BIs have to offer. Another new feature of third generation BIs is the exploitation of networks by incubators, which provide tenants with preferential access to potential customers, suppliers, technology partners, etc. (Hansen et al., 2000). These "networked incubators", which emerged since the late 1990s, establish institutionalized networks which implies that the networking is no longer dependent on the personal networks or contacts of individuals (Bøllingtoft and Ulhøi, 2005). The literature posits that the networking is the most important factor in successful incubator programs (Hansen et al., 2000).

Dimensions of business incubation

We conceptualize business incubation along three dimensions: infrastructure, business support and access to networks (e.g. Barrow, 2001; Smilor and Gill, 1986). Business incubation studies have been mostly atheoretical (Hackett and Dilts, 2004) and often relying on incubators' self-reported data. In this section, we ameliorate this shortcoming by proving theoretical arguments on *why* business incubation can help young companies to establish and develop themselves. At the same time, we review previous incubation studies to know *what* BIs are already providing to their tenants.

Infrastructure

The term business incubation is inextricably tied to infrastructure. Since the first generation of BIs, core of their value proposition has been to provide tenants with infrastructure (Adkins, 2002). Although space is progressively less important for their value proposition, the majority of BIs remain property-based (Phan et al., 2005). Infrastructure is often associated with space and shared resources. Space is traditionally linked to available office space (e.g. Barrow, 2001) rented in more or less favorable condition to incubatees (Bergek and Norrman, 2008). In addition, BIs often have small production facilities or mixed units available to their tenants (OECD, 1997). Provision of space is critical to business incubation. Empirical evidence suggests that infrastructure is the most beneficial feature to tenants (Chan and Lau, 2005), particularly for tenants in early stages of development. Shared services and resources such as reception, clerical services, meeting rooms, conference rooms or car parking (EC, 2002; McAdam and McAdam, 2008) complement the basic office space offered and are normally available in BIs. More specialized premises, such as laboratories and research equipment, can also be placed under shared services and resources (Grimaldi and Grandi, 2005).

The concept of company space together with shared services and resources has the potential to impact new firms on many levels. First, it reduces overhead costs as well as the burden of planning, setting up and paying individual providers. Also, incubators provide new firms with services they probably would not have access to during such early stages of development (car parking, meeting rooms or reception services are examples of this). The impact varies according to the level of rent price. Second, since prospective tenants have to pass a competitive selection procedure, a BI provides an external signal of quality, increasing selected tenants' external credibility and legitimacy. External legitimacy has a positive impact on young firm's survival even in situations of resource scarcity (Singh et al., 1986) This effect can vary according to the location of the BI. For instance, a technology-based venture benefits more in terms of credibility if located during its first years inside a university campus or a research institution. This also facilitates collaborations between the tenants and the university or research institution. Finally, when young firms are put together under the same roof there is a potential for synergies between them to arise.

Business support

New firms are by definition inexperienced. They often lack the necessary management processes and organizational routines to cope with sudden environmental shifts. 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 and Schussler, 1990; Henderson, 1999). The liability of newness can be reduced by external credibility (Singh et al., 1986), as discussed

above. In addition, business support such as experienced advice can provide valuable help geared towards accelerating the venture's learning curve. By doing so, the 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' human capital and therefore have a potential impact on their development and performance (Colombo and Grilli, 2005; Davidsson and Honig, 2003).

Business support services are integral part of incubation (Lalkaka and Abetti, 1999; Lalkaka and Bishop, 1996) and arguably their most complex dimension. Previous work on business incubation has focused on two main aspects of business support: coaching/mentoring and training. Coaching/Mentoring is typically referred to as an important service BIs provide to their tenants (Hansen et al., 2000; Mian, 1996). Coaching/Mentoring services generally mean that tenant firms are assigned coaches or mentors either for a fee or free of charge. This kind of service is critical to tenants' timely graduation (Peters et al., 2004), proving its impact on firm development (cf. Robson and Bennett, 2000). Training is also often available within BIs (Aerts et al., 2007; Barrow, 2001) and has been found to have a positive influence on tenants' performance (Peña, 2004).

Access to networks

Access to professional business services or financial resources via networks of professional contacts is also part of the incubator concept (Hansen et al., 2000). Providing access to networks with the aim of stimulating and fostering collaborations is one of the most important features of BIs (Bøllingtoft and Ulhøi, 2005). In fact, Lee and Osteryoung (2004) posit that this should be one of the key functions of any incubation centre. After understanding specific tenants' needs, the incubator should connect them to appropriate networks such as suppliers, costumers or investors (Kirwan et al., 2006; Lee and Osteryoung, 2004). Furthermore, empirical evidence suggests that access to networks is critical for the development of tenant companies (McAdam and McAdam, 2008). Access to financial resources is often offered by BIs (Aerts et al., 2007). Connections with business angel networks and venture capital firms is an important way of providing financial resources during the early stages of the tenants' development. Also, some incubators have a small budget to provide financial support directly to their tenants (Peña, 2004).

The concept behind the idea of compensating for a lack of resources using networks is social capital (e.g. Portes, 1998). New firms seldom have access to established networks to compensate their lack of human and financial resources. 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 and Honig, 2003; Yli-Renko et al., 2001). Accessing professional business services via networks is commonly out of reach for new young firms. 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.

New firms often need finance for development. Typical source of capital for new firms are business angels, venture capital firms or public subsidies (Clarysse and Bruneel, 2007). Among those, venture capital has an important influence on the professionalization of the venture. 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 and Puri, 2002).

RESEARCH DESIGN

Research context

To gain more insights in the interplay between the supply and demand of business support services provided by incubation centers, we set out to investigate a small number of cases. Therefore, we selected seven incubation centres in different European countries: Bedrijfstechnologisch Centrum Twente (Overijssel, the Netherlands), Technologieförderung Münster (Münsterland, Germany), Erasmus European Business and Innovation Center (Brussels-Capital Region, Belgium), Jülich Technologiezentrum (Cologne area, Germany), Chalmers Innovation (Gothenburg, Sweden), Normandie Incubation (Lower Normandy, France) and Innovation Centre of DeMonfort University (East Midlands, United Kingdom). The incubation centers in the study are from regions which represent the diversity within EU regions in terms of economic activity, R&D intensity, and

employment in Science and Technology. **Erreur ! Source du renvoi introuvable.**Table 2 presents an overview of those figures, such as the Gross Domestic Product, Gross Domestic Product per capita, Gross Expenditure on Research and Development, and the percentage of labor force employed in science and technology.

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Table 2 shows that Overijssel and Cologne have a GDP per capita slightly above the EU average. East Midlands, Vastverige, and Brussels-Capital Region have a GDP per capita which is well above the EU average ranging from € 31.622,6 to € 59.412. Conversely, Münster and Lower Normandy have relatively low GDP per capita compared to the EU average. With respect to the gross expenditure on research and development, we see that Cologne and Vastverige have a higher than average expenditure. Similar to the GDP per capita, Münster and Lower Normandy have a gross expenditure on research and development that is below the EU average. Further, we see that the proportion of labor force employed in science and technology is well above the EU average in the regions Brussels-Capital, Cologne, and Vastverige; with Münster and Lower Normandy having a smaller representation in this sector. Based on these indicators, we can conclude that the regions Brussels-Capital, Cologne and Vastverige are above the EU average, Overijssel and East Midlands represent the average EU region while Münster and Lower Normandy are below the EU average.

We used several criteria to select the cases in each region. First, we wanted to have a representation of business centers created in the three generations. This way, we can examine the differences and communalities between the generations regarding the infrastructure, business support, and access to resources. Second, we only selected incubation centers with the mission to support 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 and Norrman, 2008)). Third, we selected both not-for-profit and for-profit incubation centers per generation. Public incubators and private incubators are the two main business models of BIs (Grimaldi and Grandi, 2005).

For the first generation of BIs, we study the Bedrijfs Technologisch Centrum Twente (NL) and Technologieförderung Münster (DE). 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 m^2 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 a local 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 m^2 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.

The cases for the second generation incubation centers 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 m^2 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 incubation centers 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 any further subsidies after founding nor does it take shares in the tenant companies. Therefore, office space rental is JTZ's sole source of revenues.

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 et al., 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 m^2 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 École 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 m^2 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. It was founded by DeMontfort University and the Leicester City Council bringing together several others partners, such regional development agencies. The IC has 18 office units including two dedicated workshops for small production manufacturing and prototyping. The centre operates a non profit; revenues come mostly from the public sector (75%) and tenants rent (25%). provides an overview of the main characteristics of the seven incubation centers.

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Data collection and methods

We employed a two-step research design that spans a qualitative study of the incubation models and a quantitative study of the tenants. First, we performed in–depth case studies of the five incubation models under study. The qualitative research methodology is preferred given the need for a deep understanding and local contextualization of the topic (Miles and Huberman, 1994). As suggested by Eisenhardt (1989a), we did a comparative study to benchmark the different models. The data for the first step was collected during structured face-to-face interviews with the key staff of the incubation centers. The number of interviews ranged from three to six per incubation centre. The goal of these interviews was twofold: 1) to map the services offered to tenants; and 2) to get insights in the incubator's business model. Based on this information, we developed a survey to be conducted in the second step of the data collection. In the second step, we interviewed top management of tenant companies. Next to general information about the company (e.g. age, size and sector), a key issue of these interviews was to gain insight in: 1) the extent to which the tenants use services offered by the BI; and 2) what the impact of these services in the company's growth is. The data collection was carried out from late 2004 to early 2007. We duly collected additional data about the seven BIs and the tenant companies via a range of secondary sources such as websites, organization brochures, annual reports, newsletters and press releases.

THE SUPPLY SIDE OF BUSINESS INCUBATION

In this section, we focus on the analyzing the supply side of business incubation by looking at BIs' value propositions. We compare what BIs providing in terms of infrastructure, business support and access to networks. We group the analysis by generation of BIs.

Infrastructure

We compared infrastructure within BIs using two variables: space and shared resources. There is no significant difference across generations of incubators (**Erreur ! Source du renvoi introuvable.**). 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.

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Business Support

Each generation of BIs provide coaching and mentoring (**Erreur ! Source du renvoi introuvable.**). The coaching/mentoring teams typically cover both scientific and managerial areas of expertise. The only observed differences are in the way they provide this kind of service. EEBIC, CI and NI have in-house coaches and mentors: EEBIC and CI assembled a team of experts while within NI the management team is the main source of coaching. Conversely, BTC and IC act as brokers to provide coaching and mentoring: BTC through one coach who is also an incubator tenant while the IC via a network of experts. TFM did not mention any kind of formal coaching.

We considered training as any kind of formal organized workshop, seminar and access to complementary information. All generations of BIs cover 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 (JTZ and CI).

Access to networks

We investigated access to networks using two variables: professional business services provided through a network of contacts, and access to financial resources. Professional business services through a network of contacts include basic services such as accounting (Gooderham et al., 2004), legal or administrative support (Merrifield, 1987), as well as more specialized services such as strategy consulting (Lee and Osteryoung, 2004) or patent attorneys (Rice, 2002). Professional business services are readily available for the second and third generation of incubation centers, but not within the first generation ones (BTC and TFM). Access to such services can be provided passively by locating within the incubator a university technology transfer office as well as consulting firms, insurance companies and project management firms (e.g. JTZ). Conversely, CI negotiated preferential agreements with major accounting, law and consulting firms to provide their tenants with a minimum level of free hours. NI subsidizes its tenants to access professional services including usage of scientific equipment and materials. The 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.

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

THE DEMAND SIDE OF BUSINESS INCUBATION

In this section, we focus on the demand side of incubation services by taking a closer look at the profile of the tenants and by examining the extent to which tenant firms use the services offered by BIs. We group the tenant firms per generation of incubation center. By doing so, we have three groups of tenants firms, which allows statistical analysis.

Profile of tenant companies

We consider the following indicators to gain more insights in the characteristics and profile of the tenant companies: relocation, age at entry, years at incubator, firm size, and serial entrepreneurs. The first indicator is the percentage of relocated firms in the incubator at moment of data collection. One of the main functions of incubators is to bridge the entrepreneurship gap (Aernoudt, 2004). Incubators should focus on encouraging and supporting people to start their own business rather than accepting relocated companies. Quintas et al. (1992) argue that low impact of intermediaries on new firm creation processes results from high number of relocated companies. Relocated firms are companies that were created before entering the business incubation center.

Table 4 shows that almost half of the tenant firms of the first generation incubators and more than 50 percent of the second generation incubators were founded before entering the center. In contrast, more than three quarters of the third generation companies where created at the incubator's premises. Closely related to this indicator is the age at entry of the firms. Age at entry has an important impact on the building of capabilities and routines of organizations (Autio et al., 2000). In contrast to older

organizations, young firms have to shape their organizational structure, processes and routines. Older organizations have developed substantive capabilities (Zahra et al., 2006) which hampers their ability to change their existing capability set and makes it more difficult to unlearn established routines. Table 5 shows that there is a significant difference between the tenants firms regarding their age at entry ($p \leq .05$). Third generation tenants are very young (less than one year old) at the moment they enter the business incubation center. First generation tenants are almost two years old while the firms located in second generation incubators are more than seven years old.

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TABLE 5 ABOUT HERE ++

Next, we assess the number of years the tenants are located at the incubators. An important characteristic of incubation centers is timely graduation (Aernoudt, 2004). The needs of organizations change as they grow and become more mature and established (Clarysse and Bruneel, 2007). For example, the need for financing is associated with the different phases of the company life cycle and consists of different stages (Cieply, 2001). Therefore, incubators have to monitor graduation with a 3-year time window for graduation as a conservative period (Rothaermel and Thursby, 2005a). Table 4 shows that third generation tenants stay less than two years in the incubators whereas first and second generation tenants stay for much longer periods ($p \leq .001$). Since the tenants of the first and second generation incubation centers are significantly older when entering the incubation center and these tenants stay there for a longer period than the tenants of first generation centers, it is not surprising to see that the first and second generation tenants are significantly larger ($p \leq .01$).

Next to age and size related indicators, we also examine whether there are differences regarding the profile of the firms' management team. Here, we consider the extent to which the entrepreneurial teams have previous entrepreneurial experience. Previous entrepreneurial experience of founders plays an important role in the development and success of ventures (Politis, 2005; Shane, 2000). Serial entrepreneurs increase the legitimacy and reputation of the firms (McGaughey, 2007), which facilitates the acquisition of external resources and accelerates market acceptance. Also, people with previous entrepreneurial experience have larger social networks that are beneficial for the firm's development (Mosey and Wright, 2007). Table 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 incubation centers.

Usage of business incubation

In this section we examine to what extent tenants make use of the infrastructure, business support, and access to resources offered by the different generation incubation centers. Table 5 shows that there is no difference between the three generations regarding the usage of office space and shared resources. When looking at the extent to which tenants use business support, we observe significant differences for both coaching/mentoring ($p \leq .001$) and training to develop business skills ($p \leq .001$). Table 5 indicates that third generation tenants use coaching/mentoring more intensively than their first and second generation counterparts. As for training programs, we see that less than a quarter of the first and second generation tenants make use of them. In contrast, the overwhelming majority of third generation centers' tenants enjoy active coaching and enroll for training programs. A similar picture emerges when we look at the usage of access to resources. It seems that especially the third generation makes use of professional service providers such as IP experts and seed or venture capital. The usage of both types of external networks differ significantly between the three generations of BIs ($p \leq .001$)

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DISCUSSION

The three generations of BIs do not differ greatly in their value propositions. All generations provide their tenants with approximately the same kind of infrastructure, business support and access to resources. Yet we see that there is a significant difference in tenants' usage of services. Third generation BIs' tenants use systematically more services than their counterparts located in first and second generation BIs. The profile of the tenant companies is also statistically significant between

generations of BIs. First and second generation tenants are older when they enter the incubation center and typically stay longer incubated than first generation tenants. Third generation tenant companies are created by serial entrepreneurs whereas novice entrepreneurs are more prevalent among first and second generation tenants.

There seems to be a sort of imprinting effect of the incubator generation, i.e., even in the cases in which incubators set out to change their business support structure (from infrastructure to coaching, in the words of one EEBIC manager), they fail to do so consistently if they don't change their selection criteria and exit policy. It might also be a matter of priorities in the goal setting. If renting square meters is most important in the business model of a for profit incubator it is to be expected that this will dominate the selection policy.

It is obvious to say that older and bigger companies need less (or, at least, different) services than younger venture. The novelty found in this research is that relative old companies might be housed in some of these incubators. This leads to the situation which we observe here: although the incubator is providing services beyond space and shared resources, there are not particularly helpful for the current profile of companies. The incubator generation combined with permissive selection criteria and slack exit policies leads to a tenant profile which does not necessarily need business support services and access to networks.

This study is not without limitations. Firstly, there is the possibility of a selection effect of the choices made for the incubators. With these seven incubators we actually found a reasonable spread over the three periods, however due to the particular goals of some of the incubators some of the outcomes might reflect these particular goals instead of showing a generation effect. For example findings concerning the age of tenant companies can also be explained by the character of the pre-incubator Normandie Incubation. As a pre-incubator it is bound to have very young companies. It is subject to further research if this is typical for third generation incubators.

Another difficulty we found in this research is that some of the incubators offer services themselves while others offer it through affiliated partners. This might be reflected in the answers to questions regarding the services from the incubators themselves. This opens up the question whether research on incubators should not be focussing more on the network of service providers and the complete processes of support use of tenants regardless where in their network they get it. This might show that the differences between older and newer generation incubators is smaller then what this data shows.

CONCLUSION

We set out to research whether there are differences between the value propositions between each generation of BIs. Our data suggest that the value propositions of all the cases in our sample are similar. However, real differences between the value propositions delivered by BIs are only visible if assessed by the experience of their tenants. Therefore, our second research question sought to understand whether the value proposition of older generations of BIs is equally valuable to tenants. The data shows that there appear to be a great difference between the used set of services by tenants of these three generations of BIs. The data from the third generation shows that tenants use a broader spectrum of business services along all the three dimensions of incubation. For the older two generations this is less obvious. Due to the differences in age and stage of growth of the tenants it is clear that many of the tenants of the older incubators do not use anything else then the infrastructure offerings.

Future quantitative research should make clear of this is really a generation effect, or that there are structural differences between incubators regardless of their own age. From a research methodology and theory perspective it seems useful to develop a more processual and network oriented method of research. This might reveal to what extent incubators also should be considered as networked organizations instead of the closed organizations as we now envisioned them (cf. Bøllingtoft and Ulhøi, 2005). In ongoing research, we employ for that purpose a social system approach where we can analyze the sustainable development of actors in networks in a multi-level and multi-dimensional manner ((Groen, 2005; Groen et al., 2008; Kirwan et al., 2006). Focusing on start ups in certain stages of development is also of interest. Especially in the earliest phase of development of a firm the influence of BIs' services is probably largest. A design where we could follow entrepreneurs longitudinally in this early phase would enable us to say more about the need for and timing of the services for high-tech start-ups. From an organizational point of view it is then the question whether or not these services for segments of differently developed firms can better be offered in heterogeneous

populated incubators (e.g. BTC), or in homogeneous specialized centers such as Normandie Incubation in this sample. Furthermore, it is interesting to look further into the networked incubator type.

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TABLES AND FIGURES

Table 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 neighborhoods, 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).
European Commission. 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 (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).

Table 2 - Regional data for the regions in which the incubation centers are located.

	GDP[a] (million €)	GDP per capita [a]	GERD[b] (% of GDP)	Human resources in S&T[b] (% of labor force)
EU-15	10.934.467,8	27.958,9	1,89	37,9[d]
Overijssel (NL)	31.861,8	28.576,6	1,16	38,8

Munster (DE)	62.616,0	23.890,1	0,91	36,3
Brussels-Capital Region (BE)	60.897,5	59.412,2	1,14	52,1
Cologne (DE)	126.458,7	28.861,3	2,75	45,3
Vastverige (SE)	60.717,5	33.348,4	5,39	42,7
Lower Normandy (FR)	33.944,6	23.275,2	0.95[C]	35,9
East Midlands (UK)	51.598,6	31.622,6	n.a.	37,4

[a] Source: Eurostat, figures 2006
[b] Source: Eurostat, figures 2005
[c] figure for 2004
[d] figure for EU-27

Table 3 – 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
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

Table 4 – Profile of tenants per generation of incubation centre

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

Table 5 – Usage of business incubation per generation of incubation centre (%)

Business Incubation	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 resources				
Professional services providers	48.0	63.2	96.3	≤ .001
Seed or venture capital	12.0	52.6	70.4	≤ .001

Table 4 – Supply of business incubation in the researched incubator centers

	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**. **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/Mentoring – Training	Tenants access **coaching** on an ad hoc basis via incubator manager. One of the tenants is a consultancy firm who provides mentoring on a commercial basis and partially funded by external sources. Further **training** is only offered by the mentor.	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 Chambre 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 a network of external coaches. Their backgrounds cover fields such as management, marketing or finance.

	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	There is no evidence of **professional services** being readily available. Rarely brokerage is done by request. There are no preferred sources of **venture capital**. ABN is one of the shareholders.	No **professional services** access is provided by the centre. No preferred sources of seed or **venture capital** exist. Yet a local savings bank owns 6% of the incubator.	**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 incubation centers. 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**.