UNDERSTANDING INCUBATOR VALUE – A BUSINESS NETWORK APPROACH TO UNIVERSITY INCUBATORS

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ABSTRACT

Underlying the concept of Networked Incubators (i.e. incubating facilities that induce networking activities) is the notion that networking is a cornerstone for successful entrepreneurial behaviours.Although previous research has studiedfactors that help fostering business relationships during the incubation process, little is known about the expectations that entrepreneurs have when joining an incubator, or about entrepreneurs' degree of satisfaction regarding the fulfilment ofthose expectations in Networked Incubators. This studyaims at addressing this particular issue by positingnew ways of measuring incubator performancefrom the entrepreneurs' perspective. Entrepreneurs face strongchallenges when launching their ventures, especially the*liabilities of newness* and*liability of smallness*.This study identifies four dimensions of valueby which incubators can help entrepreneurs address those initialliability challenges: Legitimacy/Credibility;Infrastructure; Business Support,and Networking.We focus on the case of UPTEC –Science and Technology Park of the University of Porto,to analyse and evaluate these different value aspects.The research uses a multi-method approach that combines qualitative and quantitative tools, with the use ofstatistical analysis, interview content analysis, and social network analysis. Findings show that theexpectations held by entrepreneurs fit the principles underlying the concept of a Networked Incubator: these expectationsare relatively high for the dimensions of Infrastructure, Legitimacy, and Networking (both internal and external). Entrepreneurs

holdlower expectations regarding the Business Support provided by theincubator. However, contrary to the expectations and the principles underlying Networked Incubators, arelational analysis of the incubator shows a network with low levels of density, intensity, and few linkages developed between entrepreneurs withinthe incubator. The findings also reveal a number of factors that affect the effectiveness of the networking process, namely: space configuration, networking institutionalization, the matching between projects with complementary resources and capabilities, incubator portfolio configuration, and the investment required both by incubator management team and entrepreneurial teams.

Keywords:
University Incubators, Networked Incubators, Business Networks, Value, Entrepreneurship

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INTRODUCTION

Business incubators (BIs) and science and technology parks (STPs) have been gaining increasingsocial and economic relevance, associatedwith the role played by them in promoting local job creation, technology transfer and economic development based on innovative products and services (Peters et al., 2004) In the current context ofglobal competition, Phan, Siegel and Wright (2005) stress that an increase in the rate of investment and success in R&D can allow advanced industrial countries to compete with emerging economies thatbenefit from significantly lower labour costs. The need to promote the creation of small technological and innovative companies has contributed for the substantial growth of both public and private investment in BIs and STP.

The phenomenon of incubation is extensively covered in the management literature.Link and Scott (2003) argue thatthe visible increase of support institutions such as incubators went hand in hand with an acceleration in the academic debate concerningwhether such initiatives enhance the performance of corporations, universities,and regions.Phan et al (2005) refer two additional streams of research that are relevant in this context: One stream focuseson the strategies that companies, universities or regions may adopt regarding business incubation, particularly in order to explorethe knowledge and technology developed by universities. The other research stream relates to the role of networks in the incubation process, i.e., the role that relationships between various business actors can play in the development of new ventures. This present study follows the latter stream of research by focusing on the networking dimension that underpins the incubation process.

It has been widely recognised in the literature thatstart-ups[1] face unique challenges (Bolingtoft andUlhoi, 2005). During the launch phase, the entrepreneur faces difficulties at several levels. Some authors stress the lack of management knowledge and/or skills, particularly in the case of technology-oriented projects (Mcadam, Mcadam, Galbraight and Humphreys, 2006), whilst other authors point out that the company's newness (Kale andArditi, 1998) and smallness (Allen et al., 1985; Bøllingtoft et al., 2005)are the main obstacles for start-up's rapid and effective development. A BIis believed to provide the

[1] In this paper, the term startup refers to a new business company in incubation; the term entrepreneur refers to the start-up's promoter.

access to the support that is required to help the start-upovercomingthose limitations and challenges (Phan et al, 2005).However, thereexists no consensus in the literature as to the specific value of incubators, and regarding the entrepreneurs' expectations regarding the incubator value. In this context, we focus especially on issues around Networked Incubators (NI),i.e. incubating facilities that induce networking activities, as one of the most advanced forms of BIs.

In order to explore these issues, this paper is structured as follows. First, the main challenges that start-ups face are reviewed. Thenthe concept of business incubators, and their types of support are discussed. Due to the specific focus of our study on networking processes, the concept of Networked Incubators is introduced, together with a brief debate about obstacles to networking.Next, the need to evaluate the performance and value creation of BIs is identified, particular using entrepreneurs' perspectives. An integrative framework is developed which uses all the main theoretical concepts.We then introduce our methodological choices, the case study and analysis, and our main findings. Finally, the paper closes with a discussion and suggestions for future research.

CHALLENGES FACED BY START-UPS AND THE IMPORTANCE OF BUSINESS INCUBATION

The life of a start-up presents unique challenges and difficulties, whichcan be found at several levels, resulting namely from their lack of management knowledge and/or skills (particularly in the case of technology-oriented ventures) (Smilor, 1987), or as a consequence of company's newness and smallness (Bolingtoft andUlhoi, 2005; Phan et al, 2005). Dependence on as yet undeveloped resourcesmake entrepreneurs resort to using additional support provided by incubators (Klofsten and Mikaelson, 1996). Thus, the incubation phenomenon is mostly related to the early life stages of a companyin which resource configuration are build by the start-up company (Bergek and Norrman, 2008).Some of the strongest challenges that start-ups face relate to the concepts of the *liability of newness* (Kale andArditi, 1998) and *the liability of smallness* (Allen et al., 1985; Klofsten and Mikaelson, 1996;Bøllingtoft et al., 2005). These liabilities can be a strong deterrent for launching a start-up, given that the scope and scale of resources and capabilities available for these companiesare rather limited, especially at their inception stage.

The*liability of smallness* refers to theimpact of size andthe level of available resources by start-ups. All the difficulties related to the lack of scale underlying entrepreneurial projects relate to this liability. For instance, Allen et al. (1985) refer that the lack of management

skills and/or access to venture capital represents a typical difficulty of the new andsmall businesses.Bollingtoft et al. (2005) add that the absence of administrative support or of reduced operational costs such as rents or fees for services are typical barriers of the early development phase of a new business.Thus, incubators can be seen as tools to create a positive environment for small business to develop their ventures (Allen and Kahman, 1985).The location of the start-up in a BImay therefore provide the access to a pool of resources and capabilities that may help overcomingitslimitations (Peters et al., 2004).

Regarding newness, a start-up faces the challenge of proving itself to numerous business actors during itsinitial phases. At the inception stage, the company's and/or the entrepreneur'srelevant social capital is often still weak, hindering the development of social and business relations. In this context, the*liability of newness*(Kale andArditi, 1998) refers to the start-up's lack of visibility in the market and to the inexistence of connections to a network of resources. This may hamper the development of external processes, such as the establishment of stable relations with customers, creditors, suppliers and other organizations. Consequently, accessing needed resources and capabilities such as funding, markets or partnerships may proof difficult.Additionally, theliability of newnesscan also impact endogenous processes related to learning new roles, developing trust and cooperation between members of the organization (Kale and Arditi, 1998). BI's therefore provide effective solutions to this problem because it can help the start-up prove its credibility and legitimacy to other actors (Bøllingtoft et al., 2005; Salvador, 2011).

BUSINESS INCUBATORS

BIs and STPsprovide "*the social environment, technological and organizational resources, and managerial expertise for the transformation of a technology-based business idea into an efficient economic organization*" (Phan, Siege and Wrigh, 2005, pp. 107). While STPsare traditionally more focused on regional development,BIs relatemostly to the concept of entrepreneurship (Ratinho and Henriques, 2010); nevertheless, these two types of innovation centres share similarities in their basic characteristics and goals (Phan et al, 2005). The term business incubator is normally usedasan umbrella concept to describe such groups of institutions, which may be problematic as they can be quite heterogeneous (Scilitoe and Chakrabarti, 2010). For example, university incubatorshave some specific characteristics that may influence the incubation process, making them distinct from a STP incubation situation. University incubators integrate multiple stakeholders– e.g., researchers, technology transfer offices and entrepreneurs – with own motivationsand agendas (Mcadam et al, 2006).These

actors bring different and possibly divergent perspectives that impact the incubation process.Furthermore, Mcadam et al. (2006)show that context factors (e.g. industry, dimension, national innovation systems, life cycle and newness grade) may alsoinfluence the innovation management process.

A possible starting point to differentiatebetween BIs is to analyze the type of support that they provide to their tenants, i.e. the start-ups. Initially, BIs concentrated their support on infrastructure and on advice offered to start-ups by amanagement team (Phan et al, 2005; Salvador, 2011; Hansen et al., 2000).Currently, there are two major approachesto define incubators' activity(Smilor and Gill, 1986). The first approach focuses on providing space to the start-ups at a more affordable price. The strategy is primarily a real estate-related one and success is defined in terms of space occupation rates and space rentals. The second approach focuses instead onsupportingthe creation and development of new businesses. In this case, success is defined according tothe success and expansion of these new businesses. A BI may choose to adopt the space provision strategy, the business support strategy, or a combination of both(Smilor and Gill, 1986; Hacket and Dilts, 2004; Mcadam and Marlow, 2008).

The business supportstrategy can be translated via the provision of various resources and activities that are likely to help developingstart-ups' business. This may include access to physical and technological facilities, information technologies, or sources of funding;services such as business counseling, public relations, recruitment, accounting and legal counseling, pooledpurchases, or even an organized network of contacts (Hansen et al, 2000). Such services can aim at reducing the start-ups costs: shared space leased atafavorable price, or shared support services to reduce fixed costs. Other services can focus on helping develop the business: business support or professional counseling, or creation and mobilization of an internal or external network(Bergek and Norrman, 2008). Overall, the business support offered by the BI management team to the start-ups falls intotwo basic types (Scillitoe and Chakrabarti, 2010):management support, and technical support.Management support relates to dimensions such as business planning, fiscal support, staff recruitment and access to capital or business contacts;technical support consists ofproviding access to technical knowledge or to scientific knowledge created by the universities.

A start up can also gain other benefits resulting from their integration in a BI.The support provided by a BI can work as a type of certification for the start-up, helping it to overcome or minimize the usual initial lack of credibility vis-a-viscustomers, suppliers, partners, or sponsors (Akerlof, 1970). Additionally, the BI's brand may work asan additional reputational signifier for the start-ups (Salvador, 2011):the association with the BI's brand

may enhance the start-up'scredibility and legitimacy(Smilor, 1987). However, Ulhoi and Bollingtoft (2005) emphasize that while favorable rents for space and equipment, or reputation, are important factors, incubators should focus more on developing a network of businesses that canhelp companies to survive in the long run. Phan et al (2005)discuss the importance of the networking dimension of BIs when suggesting that one can consider the *network*as an appropriate metaphor for the incubator itself. The importance played by networking in BIs is therefore further explored in the next section.

NETWORKED INCUBATORS

Several authors have studied the role of business networks in incubation processes and the influence of networking in the development of start-ups' businesses(for example, Bolligtoft and Ulhoi, 2005; Cooper et al, 2010; McAdam and Marlow, 2007; McAdam et al, 2006; Hansen, 2000). In a BI context, networks based around business relationships create value to the start-ups in several different ways, namely byproviding access to new ideas and resources that support business processes,enhancing credibility and reputation through alliances with reputable partners, or by facilitating knowledge exchange and the generationofcollective learning (McAdam et al, 2006).In this sense, Networked Incubators (NI) (Hansen et al., 2000) offer an unique potential for business development, by providing access to an extensive and valuable network of resources internally within the BI but also externally that can be used and leveraged by the start-ups.

NIsexhibit distinctive features in relation to BIs, namely a specific configuration: whilstthe configurationsassociated with typical BIs are intended atpromoting business activity and offer advantages of economies of scale, NIs' configurationsaim particularly at adding features such as preferential access to internal and external networks (Hansen et al., 2010). NI's have specific mechanisms to promote relationships and partnerships between the start-ups teams internally, and other actors externally, thus facilitating the flow of knowledge, resources, and talent (Mcadam et al., 2006.) The networking mechanisms offered by NIs help start-ups to identify and shape key strategic partnerships andattract expertise and interest (Hansen et al., 2000; Mcadam et al., 2006).In NIs, networking is institutionalized, i.e. there are mechanisms that promote business relationship building even before thestart-ups need them,allowing entrepreneurs to take advantage of those mechanisms quickly. As a result of this networking routinization, networking is less dependent on specific individuals or entrepreneurs' personal connections,and it can be expanded to include numerous companies (Hansen et al, 2000). Although these networking mechanisms may provide 'preferential

access' to a set of entities, such as business partners, it does not mean that the start-ups will obtain 'preferential treatment' from those entities (Hansen et al, 2000). That is to say, the networking established via the incubation process enables the start-ups to "*receive attention from busy people (...) without this meaning that they will have guaranteed results*" (Hansen et al., 2010, pp. 79).

NIs offer start-ups particularly favorable conditions to networkwith valuable counterparts (Bollingtoft et al., 2005). Still, the networking process may be affected by the entrepreneurs' willingness to network, as well asby other potential barriers. Regarding willingness, entrepreneurs may engage in networking due to three different sets of motivators: need for social support, need for sense of belonging to a group, and access to resources (Cooper et al., 2010). Concerning other obstacles that may hinder a start-up to fully exploit Nis networking potential, these can be categorized into two groups: 1) entrepreneurs' factors, namely time constraints, lack of information about other residents, and lack of trust (Cooper et al., 2010); 2) NI's facilities, such as physical distance and the NI's size (Bollingtoft and Ulhoi, 2005). Time constraints are of particular importance as in the start-up's early development stages, entrepreneurs' attention is mainly concentrated with everyday issues of survival.

The NI's management team can play an important role in removing or minimizing these obstacles to networking within the incubator (Cooper et al., 2010). To do that, the management team can initiate contacts between start-ups, thereby easing theconstruction of relationships. NIs may also promote joint activities between the start-ups, providing them with opportunities to get to know each other, and therefore way enhancing the incubation's social dimension.Also, the improvement of networking between the start-ups may require effective communication strategies,supported by a better understanding of the profile of each incubated firm. Moreover, the configuration of the NIs'sfacilities may be improved in order to increase the potential for start-ups' members to interact with each other, encouraging communication between themselves(Bollingtoft and Ulhoi, 2005). In addition to the physical proximity of the incubated firms, it may also be important to group these firmsaccording to their complementary skills,as:"*despite the facilities with shared services* [which]*are valuable for incubated firms, social aspects (relationships) seem to play a much more important role*" (Bollingtoft and Ulhoi, 2005, pp.283).

VALUE OF BUSINESS INCUBATORS

As the number of BI multiplies and more public and private resources are invested in these institutions, the need to assess if BIs, and particular NIs, provide value becomes even more imperative.Measuring the impact of the incubation process as a way to assess the quality and value of the BI investments is, however, a difficult task (Hackett and Dilts, 2004).It requires, for example,collecting and analyzing amassive range of data todetermine if the survival rate of new initiatives would be different if companies had notbeenincubated.Also, as McAdam et al. (2006)point out, there is no consensual definition onwhat constitutes a successful incubator. Still, the incubator performance is conceptually linked to the BI's ability to minimize the constraints that affectthe development of new ventures (McAdam et al., 2006).One of the difficulties in evaluating a BI's performance stems from the fact that value can be created and measured at different levels, e.g. at the incubator and at the start-up level.At the incubator level, performance is related to the extent to which its management model is able to respond to the expectations by both the incubator's promoters and funders, and the entrepreneurs.At the start-up level, BI'sperformance can be evaluated in terms of its contribution to the start-updevelopment, i.e. how much value it delivers to the start-up. Existing studies show that shared services (Mian, 1996, 1997), and the infrastructure element (Voisey et al., 2006; Bergekand Norman, 2008)are amongst entrepreneurs' most valued factors.

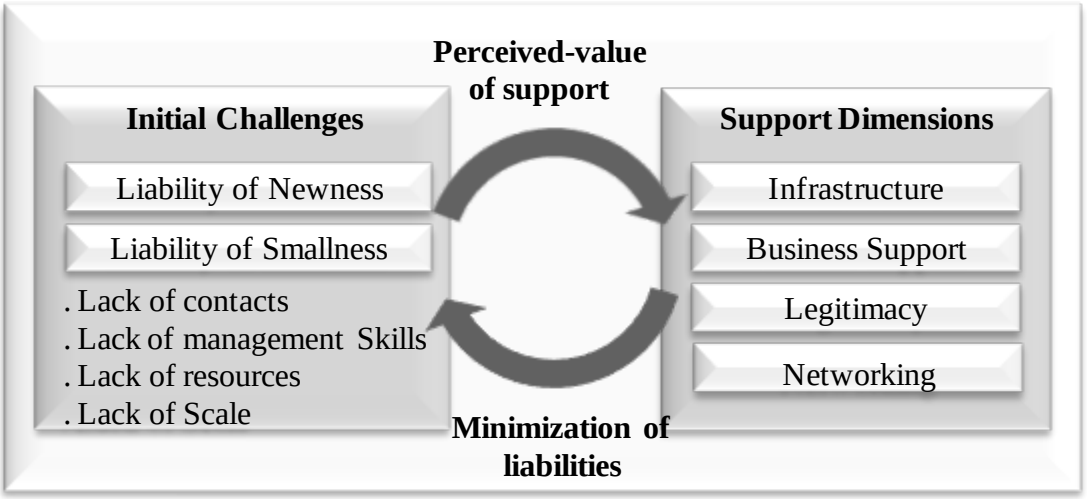
In general, it seems reasonable to expect that an entrepreneur's decision to locate his/her venture in a specific BI is linked to certain expectationsregarding the start-up-related values that are provided by the BI. That value can result from the pool of resources and capabilities provided by the BI itself, or by the BI linking the venture with actors located inside or outside the incubator, and thereby facilitating the access to valuable resources and capabilities. Despite the growing importance attributed to BIs in academic, policy and business considerations, the value of incubatorsas perceived by the entrepreneur is not yet fully understood. To address this gap, this paper aims at assessing entrepreneurs' perceptions on how expectations are fulfilled, and what type of value is created by BIs, in particular an NI.

BUSINESS INCUBATOR VALUE-ADDING FRAMEWORK AND RESEARCH FOCUS

The main theoretical concepts discussed above inform the synthesis into a conceptual framework of the value-adding aspects of a BI (see figure 1). The value potential provided by the BIrelates to the support dimensions that start-ups needin order to overcome their initial

challenges, such as the *liabilities of smallness* and of *newness*.Thesupport provided by the BI can therefore be analyzed onfour levels: infrastructure, business support, legitimacy, and networking.

Figure 1: Potential of Value-addingSupport by the Business Incubator



It seems reasonable thatan entrepreneurchooses a specific BI to launch a start-upbased on expectations regarding thatBI's potential value. However, the existing literature offers limited help to understand what those expectations are. Drawing on this observation, thefirst question set for our research therefore is as follows: (Q1) "*What are the expectations of entrepreneurs when they choose a business incubator?"*We are particularly interested in the various types of value related tothe four dimensions mentioned in Figure 1:Infrastructure, Networking, Business Support, and Credibility/Legitimacy. For a specific case, i.e. an NI, we are also interested inthe specificentrepreneurs'perception about the value they effectively receive. Thus, the second research question is (Q2)"*What is the entrepreneurs' degree of satisfaction in relation to their initial value expectations of the business incubator?"*

As networking is considered a crucial aspect in business incubation, especially for an NI as chosen for the case analysis, this study also aimsat better understanding the value of the network dimension, specifically by identifying whattypes of relationships are established between the incubated companies. Thus, our third research question is: (Q3) "*What is the nature ofthenetwork relations relating tothe business incubator?"*.Asnetworking is a complex process, our research also tries to capture the factorsthat can leverage or hinder the network densification within a BI. By answering our last question, (Q4) "*How does networkingevolve in a business incubator?"*, we aim atunderstanding howfactors such as participation in

networking activities, physical proximity, complementarity between the start-ups,amongstother factors, inhibit or accelerate networking.

METHODOLOGY AND RESARCH DESIGN

A case study method was adopted (Yin 1984, 2003),combiningqualitative and quantitative techniques. Our case study relates to aspecific university incubator: UPTEC - the Science and Technology Park of the University of Porto. According to exploratory interviews with the UPTEC and to the analysis of secondary data (e.g. UPTEC site and internal documents), UPTEC seems to fit the concept of a Networked Incubator. UPTEC's mission is to " *foster the creation of technology based companies and attract research and innovation centers of large national and international companies* (...) *through a clustering strategy and by sharing resources and services*" (www.uptec.up.pt); UPTEC has a network of external partners to assist in the development of start-up projects; UPTEC organizes regular formal and informal networking events targeted at the start-ups and/or external actors, and puts a continuous effort in matching potential partners betweenthe startups or with outside partners. When data was collected, UPTEC housed around 100 start-ups, which belonged to four different clusters (Biotechnology, Creative Industries, Sea and Technology), scattered across four different locations. The start-ups could be categorized as being in different incubation stages. UPTECtherefore offered a rich and diversified incubation context that fitted our research goals. The study included only the start-ups that had joined the incubator long enough to make networking possible, i.e. the start-ups included in the study had joined UPTEC at least four months before. With the help of the UPTEC management team, 70start-ups were identified that fit this criterion, of each 53 (75%) agreed to participate.

Data was collected mainly through a survey and semi-structured interviews with the entrepreneurs. Interviews were also conducted with the incubator board and management team, whichallowed us to understand the context and current status of the incubator, as well as how networking was dealt with and promoted by the incubator. The combination of the mentioned quantitative and qualitative techniques allowed us to understand the outcomes of the incubation process, as well as the processesthat lead to those outcomes (Tellis, 1997).

The survey filled out bythe 53 entrepreneurs was built around the four support dimensions identified in our conceptual framework (Figure1). Regarding research questions Q1 and Q2, we wanted to understand the importance attributed by entrepreneurs to each of

those four dimensions when they decided to integrate UPTEC; we also wanted to assess their actual satisfaction regarding each of those factors. We used five point Likert scales to measure both their levels of expectations and satisfaction.

We operationalized the four BI value dimensions as follows: 'Infrastructure Support' was broken down into two factors: turnkey facilities and facilities rent(Aernoudt, 2004). 'Networking Support' was considered at internal and external levels that are considered equally important to access business networks (Bøllingtoft, J.P. Ulhøi, 2005).Internal networking was related to the questions regarding joining the incubator in order to develop relationships with other start-ups, andregarding of the 'existing start-ups when deciding to join UPTEC'. Internal networks are considered particular useful as they enable tenant companies to share all kinds of resources. Lyons (2000) believes that theopportunity for networking with other start-ups is the most important service offered by the incubator.External networkingcovered two factors: support to create external relationships, and access to the University of Porto network. Inrelation to 'Business Support', we asked respondents about the technical support offered by the UPTEC's management team, and the business support offered by the UPTEC's management team. Finally, we analyzed the 'Legitimacy' dimension through understanding the importance of theUPTEC Brand, as well as the University of Porto Brand.

Research questions Q3 and Q4 focus on understanding networking aspects of the BI. In Q3, entrepreneurs were asked to indicate on five-point Likert scalesthe frequency and importance of their interactions with other UPTEC incubated start-ups, with the UPTEC's management team, and with researchers and faculty from the University of Porto.The study of interactions was restricted to UPTEC and the University of Porto, as the inclusion of all star-ups' external partners would be too complex and unfeasible to this research project. These networking activities were measured each at six levels: social contacts, business and counseling exchange ('ask for and being asked for'); technical counseling exchange ('ask for and being asked for'); commercial interaction ('buy from and sell to'); joint R&D projects; co-development of products, services or processes. Finally, we also asked entrepreneurs about the importance they gave to the networking events organized by UPTEC's management team, and how often they attend those events. After completion of the survey, all respondents were interviewed and asked to provide further details about the reasons underlying theanswers they provided, thereby providing us with a more complete understanding of the relevant issues.

Data was analyzed using different techniques. Survey data was analyzed using descriptive univariate and bivariate statistical techniques. Additionally, data pertaining to interactions (Q3) was explored using Social Network Analysis techniques, supported by UCINET software 6.0 (Borgattiand Everett, 1992). This allowed us to analyze the structure and patterns of networking interactions in the BI (Skerlavaj and Dimovski, 2006). In order to understand the causes and processes leading to that structure and relational patterns, all interviews were transcribed and contentanalyzed.

UPTEC CASE RESULTS

The discussion of results is organized around the different research questions.Table 1 provides an overview of data regarding research questions Q1 and Q2. Onlyanswers showing higher levels (corresponding to points 4 and 5 of the Likert scales) are displayed.

Dimensions	Factors	% of 4-5 answers (rather and very important	% of 4-5 answers (quite and totally satisfied)
Legitimacy	University of Porto brand	83%	80
	UPTEC Brand	65%	70%
Infrastructure	Turnkey facilities	72%	70%
	Facilities' rent	70%	52%
Networking	Access to the University's network	70%	31%
	Support to create external relationships	69%	39%
	Existing startups when deciding to join UPTEC	20%	22%
	Possibility to develop relationships with other startups	67%	31%
Business support	Business support provided by UPTEC's management	48%	35%
	Technical provided by UPTEC's management team	37%	26%

Table 1- Relevance and satisfaction on support dimensions

Discussion Q1. "What are the expectations of entrepreneurs when they choose a business incubator?"

As Table 1 shows,the majority of BI value factors previously identified inthe literature were considered rather important, or very important by entrepreneurs. Only three factors, namely 'technical support', 'business support' (both pertaining to the value dimension of 'Business Support'), and 'networking with existing start-ups', were not considered generally to be important by the majority of the respondents. It is interesting to note that the connections to the University were highly valued, not only because of its associated brand (which may add to the start-ups' legitimacy), but also because of the University's resources that may be accessed through the incubator. In terms of 'Legitimacy', it is clear that the

entrepreneurs value more highly the university brand than the incubator brand. ‘Infrastructure’value factors were also considered as one of the most important aspects, confirming the importance attributed by entrepreneurs to cost and operational issues.At thelevel of the ‘Networking’value dimension, results are a slightly counterintuitive. While the possibility to develop relationships with other start-ups within UPTEC is of great importance, the actual pool of UPTEC start-ups was considered by only 20% of the respondents as an important driver of value.Through the follow-up interviews it became clear that the majority of the respondents did not even know which businesses were currently being hosted by UPTEC at the time they joined the incubator. An important finding is that companies that indicated internal networking as keyin their decision for choosing UPTEC, also consider external networking as important. Resultsrevealthat entrepreneurs who had high expectations regardingthe possibility todevelopvaluable relationships with other incubated firms, were also strongly interested in using UPTECas a lever for the creation of relationships with external actors, namely with the University of Porto’s network.

Discussion Q2.“What is the entrepreneurs’ degree of satisfaction in relation to their initial value expectations of the business incubator?”

With the exception of the brand dimension (i.e. ‘Legitimacy’), and to a lesser extent ‘Infrastructure’, it is clear that the incubation process did not meet most entrepreneurs’ initial expectations regarding value provided by the BI. However, when value performance is related to factors with a stronger relational nature, the evaluationsare much lower. Results show an overalllower satisfaction with‘Networking’ value (external andinternal) and with‘Business Support’. Especially regarding ‘Networking’ value, which represents an important aspect of entrepreneurs’ expectations, some additional analysis is necessary. Thus, in the context of the other two research questions, this studylooks further into this networking dimension of the BI.

Discussion Q3.“*What is the nature of thenetwork relations relating to the business incubator?”*

TheUPTEC network was analyzed on several relational levels: social contacts, technical counseling, business counseling, commercialexchange, joint R&D, and joint development of processes, products or services. To understand the characteristics of the relational network alongthose dimensions, we analyzed network density and relational intensity. Network density is a ratio between the relationships that actually exist,and all the

relationshipsthat could exist in a network (Hanneman and Riddle, 2005). This way, the denser the network, the higher the number of actors related with each other. On the other hand, relational intensity is measured through the frequency of contact between connected actors. To measure intensity, we used a five point Likert scale ranging from 1-very rarely - to 5- very frequently. Both density and intensity measurements were applied to all relational levels. Table 2 displays the density for each considered relational level.

Analysis Level	Average Density	
	Without UPTEC Management Team	With UPTEC Management Team
Social Contacts	0.1118	0.1272
Ask for Business Counseling	0.0267	0.0373
Be asked for Business Counseling	0.0205	0.0283
Ask for Technical Counseling	0.0246	0.0316
Be asked for Technical Counseling	0.0253	0.0300
Buy	0.0154	0.0150
Sell	0.0140	0.0180
R&D	0.0055	0.0053
Joint process/product/services development	0.0133	0.0133

Table 2: Density Analysis concerning each relational level

In general, the UPTEC network displays a low level of density. This means that few of the possiblerelationships within the incubatorwere in fact established. This observation is valid for allrelational levels. When excluding relationships with the UPTEC management team, higher levels of density were observed forsocial contacts, with a density of11.18%; all remaining levels displayed a density level below 3%.Adding UPTEC management team to the picture didnot produce relevant differences. Still, at the level of social contacts and counseling, the inclusion of UPTEC made the network slightly denser.

Physical distance and business complementarity are recognized in the literature as factors that influence networking (Cooper et al, 2010). To analyzeif our data corroborated these findings, welooked for variations of the network density at the social level,within and between the four clusters of incubated companies (i.e. Biotechnology, Creative Industries, Sea, and Technology).Table 3 shows thatthe highest density occurs in the interactions with the management team. Interaction within the clusters is low, inter-cluster density is even lower or inexistent (Sea-Biotech). The exception is the Sea cluster, whose ‘abnormal’ density is probably related with its size (six companies) and largest distance from the other clusters.

SOCIAL CONTACTS	UPTEC	Tecnological	Sea	Creative Ind.	Biotech
UPTEC	0	0.821	0.500	0.636	0.600
Tecnological	0.821	0.231	0.030	0.072	0.044
Sea	0.500	0.030	0.400	0.008	0.000
Creative Ind.	0.636	0.072	0.008	0.242	0.005
Biotech	0.600	0.044	0.000	0.005	0.133

Table 3: Density regarding to social contacts – analysis by cluster

Additionally,data analysis initially suggests that network density is higher within clusters than between the clusters. These results lead us to explore the E-I (External-Internal) Indicator,which is used to comparethe number of established relationships within and outside groups (Hanneman and Riddle, 2005). The application of this indicator to UPTEC clustersconfirm that social contacts are developed mostly within each cluster (see Table 4).

SOCIAL CONTACTS	Frequency	% Network	Possible relations	Density
INTERNAL	478	0.626	2064	0.232
EXTERNAL	286	0.374	3942	0.073
E - I	-192	-0.251	1878	0.313

Table 4: E-I Analysis:social contacts relationships

Considering that in the UPTEC network 63% of the 764 existing relationships are internal (i.e. 478 relations), this test revealed an expected index E-I value of 0.313 (importanceof external relations in comparison with the inside ones). However, the observed value was -0.251. This is a clear indicator that at the social contact level, UPTECnetwork is essentially formed by relationships between groups of similar attributes - in this case companies located within the same cluster and thus developing business activity in the same area. Similaranalyses were carried outat the other relational levels, confirming the same inward pattern but with lower density values.

In order to better understand the characteristics of the BI network, we recalculated the network density by adding an intensity restriction. We only considered those relationships that hada frequency higherthan 2 on the 5point Likert scale. This allowed us to exclude sporadic relationships from the analysis. Table 5 illustrates the results of this analysis.

Analysis Level	Density (before intensity restriction)		Density (after intensity restriction)	
	Without UPTEC Manag. Team	With UPTEC Manag. Team	Without UPTEC Manag. Team	With UPTEC Manag. Team
Social Contacts	0.1118	0.1272	0.0475	0.0633
Ask for Business Counseling	0.0267	0.0373	0.0062	0.0083
Be asked for Business Counseling	0.0205	0.0283	0.0027	0.0030
Ask for Technical Counseling	0.0246	0.0316	0.0075	0.0087
Be asked for Technical Counseling	0.0253	0.0300	0.0041	0.0047
Buy	0.0154	0.0150	0.0062	0.0060
Sell	0.0140	0.0180	0.0044	0.0047
I&D	0.0055	0.0053	0.0014	0.0013
Joint process/prod/serv. development	0.0133	0.0133	0.0038	0.0037

Table 5: Density analysis (withintensity restriction)

The results show that, in addition to a low level of density, relationships between UPTEC actors also show low intensity. The mere elimination of sporadic relations madethe network density drop considerablyon all relational levels.As such, networking does not seem to havean expressive existence. Social contacts represented the only level where networking could be considered prevalent. The UPTEC management teamis apparently a particularly well connected actor atthe social level,also representing the most connected actor in terms of counseling interactions. Particularly social contacts are frequently considered a possible enabler of other types of interactions (Cooper et al, 2010). To confirm if that is the case at UPTEC, we looked for correlations between social contacts and other types of relational networking, as shown in Table 6.

Social contacts and…	Pearson's Correlation			
	Observed	Significance	Average	Std. Dev.
1) Ask for business counseling	0.479	0.000	0.000	0.028
2) Ask for technical counseling	0.428	0.000	-0.000	0.014
3) Joint Development	0.165	0.000	0.001	0.019
4) I&D	0.178	0.000	-0.000	0.019

Table 6: Correlation analysis between social contacts and other relational levels

Overall, results show that the correlation between the existence of social relationships and the other types of relationshipsisnot relevant. There exists association between social contacts and contacts for technical or for businesscounseling. However, social contacts seem insufficient to ignite other types of relationships which are more core business related, like joint R&D or co-development of products, which traditionally require a deeper commitment and stronger interactions between the actors. Networking can therefore be described as rather scarce at UPTEC, with low density and low intensity levels, despite its considerable networking potential. Thus, the reasons why that potential was not translated into reality become important.

Discussion Q4. *"How does networkingevolve in a business incubator?"*

We usecontent analysis of the interviews, which allowedfor an initial understanding of what and how entrepreneurs perceive to be the main barriers to networking. The first aspect to be noticed is that, in line with the survey results, the majority of respondents stated an *a priori*willingnesstonetwork with other companies incubated in UPTEC. The value of interaction was recognized by these entrepreneurs and was expressed in statements such as "*all this potential of thecompanies that are here could provide an exchange of ideas, experience and knowledge*". Another entrepreneur statedthat "*networking is very important for any company at itsstarts because nobody can win alone and these relationships are supposed to be an advantage*". Thus, it was not due to a lack of appreciation of the networking potential that start-ups did not interact further with each other. A further analysis of the interviews helped us to identify some reasons why this appreciation did not result in actual interactions.

Incubator size and lack of information about the other actors: a first identified barrier to networking wasthe lack of mutual knowledge by the start-ups about each other, within the same clusters, as well as in different ones. Most respondents pointed out that this 'ignorance'was a deterrent to the establishment of partnerships. Furthermore, despite acknowledging the existence of specificcompanies and entrepreneurs within UPTEC, entrepreneurs ignored each others' projects, activities, resources or expertise.As one respondent claimed "*we still need to goa long way, until we will communicate more with each other...and knowing who is here, who went away, who will join, what one makes*". Anotherrespondent claimed that to "*know well who is incubated and the profile of the people*" is required. Some of the entrepreneurs that joined UPTECat its initiation relate thisignorance to the growth of the incubator. One respondent explained that, at the beginning, "*we were a few companies,everyone knew each other,what each company was, who the people were. We all got along and we got to know each otherin the corridors*. […]*now there is a much greater separation and basically there is almost no contact with other UPTEC companies"*. It is also interesting to recall that the cluster that presents the highest internal density is the Sea cluster, the smallest cluster in UPTEC (only six companies). This fact may constitute an additional sign of the importance of the incubator size to development of social interaction and mutual knowledge.

Space configuration.A second aspect that was widely reported by respondents,concerned the configuration of the UPTEC space. Several interviewees stated

that the relationships they hadwere mainly with companies located withintheir vicinity. As one respondent explained, "*we ourselves related more with thepeople from this floor, that we meet outthere*". The interviews also highlighted the difficulty of establishing relationships with companies from other UPTEC centers that are geographically separated. In fact, the geographical dispersion of UPTEC (scattered across four different locations),seemedto make the creation ofrelationships between the companies a harder process. As one entrepreneur claimed,"*there is a large gap between the two clusters*[creative industries and technological clusters]. *We function as small islands where the common denominator is UPTEC … but there is no proper connection between the clusters"*. Respondents also mentioned that the lack of common spaces hinderedthe establishment of social contacts. This seems quite important as social contacts could be useful to minimize the lack of mutual knowledge and also to facilitate the exchange of information regarding projects, resources and skills of each of the start-ups.As one entrepreneur explained, "*the physical structure of space does not enhance a commonliving, at least not in this building. There are no meeting spaces…the only space there is…is outsidethe building*".

Joint activities and networking events.UPTEC developeda set of formal and informal networking events. Participation in networking activities wouldfavor, at least in principle, the interaction between the incubated companies (Hansen et al., 2000). As expressed in the interviews, networking events could present an opportunity for entrepreneurs to meet other companies, to know more about their projects, to identify the peoplebelonging to eachcompany,to increase social contacts, and to exchange experiences.Many entrepreneurs recognized the potential value of those formal and informal events. Regarding one event, one respondent stated that it "*was very important to have the opportunity to meet companies, and to discover what they were doing. This is absolutely critical because it is useful information for us and for others*". However, some respondents were disappointed withthe events' results. Some respondents felt that the events wereinconsequentafter participating. One respondent expressed the view that people "*attend these meetings really in the hope that things willsolidify somehow, that if there is a spark, then things will happen by themselves"*. Following their negative views on the results of networking events a number of respondents argued that a change in the *modus operandi* of the networking events was required, as "*this has reached its limit*". Some respondents called for a greater formalization of the networking events, making them a strongerpart of the routines of the incubation process. One respondent said: *"I don't know if this is systematized, i.e., Ithink there is still some disorganization and you can't create those links in a systematic way",* whilstanother respondent added that*"there*

was never any systematization of relationships". In addition to this call for a stronger and clearer institutionalization of networking activities, respondents also expressed the need to intensify joint activities such as coaching or project application programs, which weremention ed by several participants as being the most productive type of activities promoted by UPTEC. Additionally, others pointed to the need to create events that weremore focused on each cluster, or in combinations of clusters, as a way to intensify knowledge abouteach cluster.

In this last section, we highlighted what entrepreneurs perceiveas being the aspects that impact on the networking activitieswithin UPTEC, particular the lack of more integrated networking. However, it should be notedthat both entrepreneurs and the UPTEC management team are actors withinthe networking processesitself, and therefore their activities are also important influencers of networking activities.

*The Role of UPTEC.*The majority of respondents acknowledged the positive role played by the management team in the networkingprocess. They believed that the UPTEC management team strived to promote the integration of those incubated, namely through the organization of networking events and through the matching between firms that showed potential for synergy and complementarity. In this respect, one respondent mentioned that concerninga partnership which had developed with another company,"*much of this came about due to that matching*...". Another entrepreneur pointedout that UPTEC has this concern to create a fit between companies. However, the same respondents identified opportunities for improvement. In particular, he stated that there "*could be a greater forcing (...) in fostering these relations*",placing high expectations on the assertive role which needs to be played by the management team: "*We need a little oil in this gear for people to meet and know what each one does*". Another respondent stated that "*the advantages we have had are fundamentally of certain credibility and curiously networking, but external*".

*The Role of the Entrepreneur.*The weakness of the networking process was also a resultfromentrepreneurs'behavior. Several entrepreneurs recognizedtheirinertia in exploringnew relationships and potential synergies. A large proportion of respondents justified their inertia with lack of timeand resources to invest in networking. This lack of availability resulted in a weak participation in networking events and inlow initiativeto interact with other companies. Thelack of availability was also justified by the need to concentrate on their business ventures. One respondent explainedthat "*we are still very busy developing the various ideas we had for the company"*, and another addedthat "*Honestly…I have been a bad student in this field"*.

Complementarity and access to resources. One idea that also emerged from the interviews was that the networking potential was somehow an illusion, as the complementarity between start-ups was perceived as rather low. This means that even if the whole networking process weremore effective, and if both management team and the entrepreneurs performed better in instigating networking activities, not many companies couldsuccessfully interact with the others, as they would not have any complementary resources or activities. One respondents claimed that "*within the universe of companies that are installed here, we don't see companies with potential to be useful*.";another respondent mentioned that "*often I don't quite understand if there canexist synergies between the companies*". On the other hand, more than one company also expressed a lack of trust in relation to potential partners: "*I think that companies that are here are either my partners orcompetitors, and I think this is a barrier for people to talk with each other*".

DISCUSSION AND CONCLUSION

When deciding where to locate their start-up initiatives, entrepreneurs consider a varied set of factors. In the specific BI case analyzed in this paper (i.e. the university incubator UPTEC), expectations linked to Credibility, Infrastructure, and Networking were found to be of most value to entrepreneurs, while Business Support services werefound to be lessimportant.Credibility in our case study is associated primarily withthe University of Portobrand. In fact, itwas the factor that entrepreneurs considered as most attractive when deciding where to locate theirventure. UPTEC's brandappears at a lower level relativelyto the University of Porto's brand. Thissuggests that a strong institutional brand can be useful to overcome the liability of newness, enhancing the credibility and legitimacy of new ventures, andthus facilitating the development of relationships with potential partners. In this sense, UPTEC'sand the University of Portowere found to play an effective role relating to reputational valuethat is used by entrepreneurs withthird parties.

In line with the existing literature, Infrastructure factors are also amongst the factors that entrepreneurs consider being moreimportant in their location decisions. Infrastructure support may minimize the *liability of smallness*giventhat the scale and scope of resources available to those starting new projects are quite limited. This kind of support allowsentrepreneurstofocuson the development of their businesswithout significantly increasing the risk associated withtheir projects.

The dimensionof Business Support provided by the Management teamis the least important in the decision to integrateUPTEC. It is interesting to note that both value

expectations and satisfaction are lower at the level of technical support than at level of business support in our case. This can be probably explained by the fact that business support deals with issues that arecommon to the generality of businesses, while technical issues may be much more complex and specific to each business area (e.g. creative industries vs. biotech). This is in line withsuggestions by Scillitoe and Chakrabarti(2010) who claim that counselingby the incubators' management team is particularly valuableat the level of business support. However, and contrary to what was expected given the low level of relevance attributed to entrepreneurs to technical and/or business support provided by the incubator management team, the relational analysis shows that entrepreneurs exchange info at this level mainly with UPTEC's management team. Our results also show that when entrepreneurs seek technical or business related advice, they rely mainly on UPTEC's management team, also valuing the possibility provided by UPTEC to access the university network for that technical support. Contacts at this level between the incubated companiesare virtually nonexistent, even within clusters. This is not in line withScillitoe and Chakrabarti's(2010)work, who claim that at the technical level the role of the management team consistsprimarily inproviding network interactions with other incubatedventures.

Althoughrespondents stated that they are being interested in the possibility of networking with other start-ups within the incubator, theywere not particularly interested inUPTEC'sportfolio of incubated firms. In fact, at the time of decision, entrepreneurs did not analyze the existingportfolio of incubatedcompanies to identify potential complementaritiesof resources or activities. Moreover, our findings show that the value expectationsregarding the incubation process as a catalyst for new business relationships islargely not being fulfilled. The low density and low intensity of UPTEC'snetwork, and the fact that networking occurs mainly within each cluster, if at all,provides evidence of the limited value of the Networking dimension in the UPTEC case.Any relationships that involve a greater degree of involvement, including trade relations, co-development of process/products/services, or joint research projects, are almost non-existent within theincubator, regardless of the entrepreneurs'initial expectation.The relationships within the incubator are developed mainly at the level of informal contacts.Our findings suggest that entrepreneurs may have different attitudes towards the value of networking. In fact entrepreneurs that show the greatest interest in exploring the possibilities of networking within the incubator were also the most interested in using the incubator to access external actors, thus pointing toward the role of relationship orientation as an important moderating aspect.

To sum up, the degree of satisfaction of the entrepreneurs that integrateUPTEC varies greatly according the dimensions that are considered. Generally, the results point to a higher degree of satisfaction on the dimensions of Legitimacy and Infrastructure, compared to the Networking and Support dimensions.Although thisfinding is not new in relation to Infrastructure, the value dimension of Credibility assumes a particular importancein this specific incubator. In relation to Networking, the picture is more counterintuitive:relationships within the network are mainly of a social nature, connecting mostly actors within the same clusters. Moreover, the network generally displays low density and low intensity levels. Our results identified some factors that may explain why the potential of UPTEC as anetworking hub are not realized. Our results confirm the findings by Cooper et al. (2010) and Bollingtoftand Ulhoi (2005)aboutthe factors that have impact on the process of networking. Firstly, the incubatorconfiguration space, either by its size, geographicdispersion or the lack of common spaces, inhibits contacts between entrepreneurs, social interactions and, consequently the exchange of knowledge and the development of trust. Secondly, time constraints are associated with low levels of participationinnetworking activities,and the lowlevel of investment in new relationships. Thirdly, ignorance of other entrepreneurs and start-ups' activities and resources also hinders the development of new relationships. The intensification of social contacts between entrepreneurs located in the incubator has been suggested asa way to improve the establishment of relationships at levels that would require greater involvement, such as the co-development or joint researchprojects (Hansen et al. 2000). However, our study shows that there is a low/moderate correlation between the establishment of social contacts and the establishment of other types of relationships.

Hansen et al (2000) report that anetworked incubator should have two key characteristics: the institutionalization of networking, and preferential access to a set of relationships/partnerswith which partnerships could be formed. In the case of UPTEC, the networking characteristics as evidenced by our analysis do fulfill these characteristics adequately. Although UPTEC does organize regular formal and informal events, so far it was not yet able to make the participation in those events valuable enough to make them part of the entrepreneurs' routines. Regardingthe set of possiblepartners within the BI, there does not seem to be consensus amongst entrepreneurs regarding the value they provide.Besides the University of Porto's research network, the single identified exception is the University of Porto Business School (UPBS) that offers coaching in management and business development. This partnership between UPTEC and UPBS is successful probably because it

addresses the need expressed by several respondents to develop additionaljoint activities, particularly in the areas of management, applications for funding,andtraining.

Through our findings, this paper contributes towards answering the questions posed by Phan et al. (2005, p. 166) on "*why science parks andincubators exist*". We identify four main dimensions of value of a BI: Infrastructure, Legitimacy, Business Support, and Networking.Drawing on the principle that the degree of overlapbetween the valueoffered by incubators and the needs of start-up ventures and entrepreneurs is a measure of performance of the BI (Autio and Klofsten, 1998), this paper focuses on entrepreneurs' perspective regarding BIs' creation of value.Thus, this paper contributes to further understanding the factors that entrepreneurs consider when choosing where to locate their ventures. The identification of the most important factors can be seen as the critical areas for BI value creation, at least from entrepreneurs' perspective. Additionally, the evaluation of entrepreneurs' level of satisfaction regarding those factors can be an effective tool to evaluate BIs' performance.

This paper also adds to the empirical body of research in the area of BI and NI. It studied the case of UPTEC, an incubator belonging to a large university. UPTEC fits the concept of a Networked Incubator, as it strives to create valuable clusters of internal and external actors, as well as to promote matching and interaction opportunities to the incubated ventures.The importance attributed by entrepreneurs to the value of networking seems to confirm UPTEC's intention ofbeing a NI. However, the reality shows a low density, low intensity network. In the face of these results, it seems that UPTEC is not performing satisfactorily regarding the enabling of interactions.While its performance is perceived by the incubated companies as quite positive at the Legitimacy value(as the University of Porto and UPTEC brandsconstitute a reputational certificate that enhances the value of start-ups), as well as the infrastructure value (allowingventuresto focus on thebusiness and less on logistical constraints, and to avoid an augmentedrisk that could result from higher facilities rents or investment in own facilities), theassessment regardingBusiness Support and Networkingvalues is generally less positive.

This paper reinforces the idea that to be effective, the process of establishing new relationships requires special attention bythe incubator to specific aspects: physical proximity and the space layout, common spaces that promote social interaction andthe intensification of networking. In addition, the formalization of networking activities and its rooting in the routinesof the incubation process may help entrepreneurs to capture more easily the value of networking as well as to integrate the networking routines intheir own business

routines.Furthermore, in order to leverage the links between incubated ventures, there must be a careful selection of venturesto create a diverse and complementary portfolio of businesses. Without that complementarity, resources may be seen as redundant, reducing the value of potential partnerships. Finally, BIs may develop specific mechanisms to ease the matching of resources, expertise and projects of the various start-ups.

This work also contributes to the extant literature in the field of NIs, by providing an integrative framework based on previous business incubator studies produced by Mian (1996), Hansen et al. (2000), BollingtoftandUlhoi(2005), Bergekand Norman (2008). Additionally, by analysing the NI value for incubationfrom the entrepreneurs' perspective, this work provides a new toolto evaluatethe incubation process. Therefore, our research providesa valuable insight for businessincubators' promoters and management teams, in the sense that it helps to understand the factors that are critical in entrepreneurs' decision processes, allowing the adjustment of BIs/NIs' offerings to entrepreneurs'value needs. Our research also provides entrepreneurs with a tool to assist them in their location decisions. This analysis highlights that the availability of valuable resources is insufficient to assure that they will realize the value of it. As Bollingtoft and Ulhoi (2005, p. 275) put it, "*networks are not given but created by individuals and their social interactions with other individuals*".

LIMITATIONS OF THE STUDY AND FURTHER RESEARCH

This paper treats the start-ups as a homogeneous reality. It assumes that the star-ups included in this study face the same liabilities of newness and of smallness and use the incubator to minimize those liabilities in the same way. But it may reasonable to expect that start-ups in different incubation stages, holding different resources (e.g. registered brands or patents) or different access to external and valuable actors may use and value the incubator's resource and activities in a diverse way. The ignorance of these eventual disparities is a limitation of this study and can constitute a future research issue. This project also assumes the networking activities to be similar. However, the incubator provides very different networking opportunities, ranging from informal parties, to group coaching sessions, workshops or international business missions. An individual study of different types of events, their attendance rates, and its networking outcomes could be helpful in understanding if specific event formats may be more effective in producing specific network outcomes, e.g., at the different interaction levels covered in this study.

Additionally, the ignorance of the start-ups' external partners may also constitute a limitation of this study. Firstly, it would be useful to understand if the legitimacy and credibility associated with the incubator and the university brands is recognized by the external actors, i.e., if those brands are effective tools to grant the start-ups the credibility that they lack. Secondly, it could also be useful to identify the start-ups' external actors and the nature of their interactions. This would enhance our understanding of the network strategies developed by the entrepreneurs and the constraints underlying their network strategies.

Finally, the fact that this research is based in a single case study limits the generalization of its findings. The study of other incubators of similar (university) or different nature are needed to confirm if our findings sill still hold in different settings.

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