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Catarina Roseira<sup>1</sup>  
Carla Ramos<sup>2</sup>  
Francisco Maia<sup>1</sup>  
Stephan Henneberg<sup>3</sup>

<sup>1</sup> FEP-UP, School of Economics and Management, University of Porto

<sup>2</sup> INSPER, Instituto de Ensino e Pesquisa, São Paulo, Brasil

<sup>3</sup> Queen Mary University of London

Understanding Incubator Value – A Network Approach to University  
Incubators

***Catarina Roseira\****

*Faculty of Economics of Porto, University of Porto, Portugal*

*Rua Dr. Roberto Frias, 4200-464 Porto, Portugal*

*Email: croseira@fep.up.pt*

***Carla Ramos***

*Inspere- Instituto de Ensino e Pesquisa, São Paulo, Brasil*

***Francisco Maia***

*Faculty of Economics of Porto, University of Porto, Portugal*

***Stephan Henneberg***

*Queen Mary University of London*

\*corresponding author

**UNDERSTANDING INCUBATOR VALUE –  
A BUSINESS NETWORK APPROACH TO UNIVERSITY INCUBATORS**

***Abstract***

Networking represents a cornerstone for entrepreneurial action, nurturing relationships that provide access to necessary resources. Previous research shows that such relationships can be fostered as part of incubation processes. However, there is a lack of understanding of the underlying networking process, particularly in settings aimed at promoting them such as Networked Incubators (NIs). Moreover, little is known about entrepreneurs' expectations when joining a NI, or about entrepreneurs' satisfaction regarding the fulfilment of those expectations. We address these issues by investigating the features of networking within NIs, and by positing new ways of measuring incubator performance: performance from the entrepreneurs' perspective. The article focuses on the start-ups located in UPTEC - Science and Technology Park of the University of Porto, a NI. A combination of qualitative and quantitative methodological tools (including content and social network analysis) is used. Findings show how entrepreneurs hold relatively high expectations for the dimensions of Legitimacy/Credibility, Infrastructure, and Networking, and lower expectations regarding the Business Support provided by the incubator. However, the UPTEC network shows low levels of Networking, raising questions regarding effectiveness of NIs. The findings also reveal a number of factors that impact the value and effectiveness of the networking process within a NI.

***Keywords***

University Incubators; Networked Incubators; Business Networks; Value; Entrepreneurship; Social Network Analysis.

## ***1. Introduction***

Since the 1990's there has been a growing importance of business incubation (Honig and Karlsson 2010), supported by public and private investment (Grimaldi and Grandi 2005). Incubators are considered adequate tools to promote the creation of small innovative companies (Honig and Karlsson 2010), and to reduce the probability of new business failures (Ahmad and Ingle 2011; Sofouli and Vonortas 2007). Link and Scott (2003) argue that this increase in the number of incubators and science and technology parks went hand in hand with an academic debate on whether such initiatives enhance the performance of new ventures, associated universities, as well as regions (Schwartz and Hornych 2010). Our study specifically draws on the role of networks in the incubation process, a stream of research on business incubation identified by Phan et al. (2005). As such, our study stresses the networking dimension, i.e., the role of relationships between business actors that underpins the incubation process. We focus therefore specifically on Networked Incubators (NI) (Hansen et al. 2000), in which networking activities are considered especially critical and are therefore fostered.

It has been widely recognised in the literature that start-ups<sup>1</sup> face unique challenges (Bolingtoft and Ulhøi 2005). Their newness (Kale and Arditi 1998) and smallness (Allen and Rahman 1985; Bøllingtoft and Ulhøi 2005; Durão et al. 2005) have been identified as the main obstacles for rapid and effective development. Business incubators are believed to provide access to the support that is required to help the start-ups deal with these challenges (Phan et al. 2005).

However, despite the recognized proliferation of business incubators, their effectiveness and value contribution is disputed (see for example Abetti 2004; Autio and Klofsten 1998; Becker and Gassmann 2006; Phan et al. 2005; Schwartz 2013). Additionally, the extant literature demonstrates the difficulty of evaluating the actual value of incubation and networking activities for start-ups (Aerts et al. 2007), as well as the lack of consensus on the specific and desired value dimensions relating to incubators (Ahmad and Ingle 2011; Hackett and Dilts 2004; McAdam et al. 2006). This is particularly crucial when the entrepreneurs' expectations regarding the incubator value are considered, i.e., when a tenant-centered view is adopted. Aerts et al. (2007, p. 265) contend that "*tenant research could definitely also result in interesting conclusions and intensify our understanding of the incubator business*". In line with these issues, our *first research aim* is to evaluate the value and performance of the networked incubator from the entrepreneurs' perspective. To do so, we propose an integrative value framework that can be used by policy makers and incubator managers as a tool to carry out a systematic evaluation, i.e. to audit the extent to which an incubator provides value to its tenants and is effective

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<sup>1</sup> In this paper, the term start-up refers to a new business venture in an incubation context; the term entrepreneur refers to the start-up's promoter/owner.

in its networking goals. Thus, we answer Bollingtoft and Ulloj's (2005, p. 268) call for a “*more detailed look at [...] the specific sources of value [that a business incubator] provides to entrepreneurs and entrepreneurial activities, the organizational settings under which it works, and the practices, resources, and/or services it employs to facilitate or hinder new start-ups and subsequent growth*”.

Additionally, a clear view of business incubators' internal social and business dynamics is still required (Ahmad and Ingle 2011). As our *second research aim*, we address this gap by exploring the processes of networking within a networked incubator (i.e., between the incubator management team and the start-ups, and between the start-ups themselves). In line with Hackett and Dilts's (2004) call for a turn of attention in incubation research, from ‘*what*’ factors, to ‘*how*’ and ‘*why*’ factors, our goal is to understand the underlying processes, motivations, and outcomes of incubators' internal networking. Ahmad and Ingle (2011) also argue that there is an extensive body of knowledge regarding the structure and facilities on incubators, but not enough about the underlying processes that are taking place; this reflects a change of focus from the *incubator* to the actual *incubation process* (Hannon and Chaplin 2003), i.e., a transition from a static to a dynamic approach (Ahmad and Ingle 2011; Soetanto and Jack 2013).

This article will progress as follows: Initially the main challenges that start-ups face are reviewed. The next section discusses the concept of business incubators. Due to the specific focus of our study on networking processes, the concept of Networked Incubators is introduced. This is followed by a discussion of the issue of evaluating the performance and value creation of incubators. An integrative framework is developed which links incubator support activities to specific value dimensions addressing start-up challenges. Following on, our case study and research design is outlined, and finally, our main findings are discussed, together with an overview of our main contributions, as well as study limitations and suggestions for future research.

## ***2. Challenges of Start-up Firms***

A start-up faces unique challenges and difficulties that can be a strong deterrent for launching or developing a start-up (e.g. Bruneel et al. 2012), especially during their inception stage. These challenges can be categorized into the *liability of newness* (Hughes et al. 2007; Kale and Arditi 1998) and *the liability of smallness* (Allen and Rahman 1985; Bøllingtoft and Ullhøi 2005; Klofsten and Mikaelsson 1996).

The *liability of smallness* refers to the impact of size on available resources or skills; start-ups frequently show lack of management knowledge and management skills (particularly in the case of technology-oriented ventures; Allen and Rahman 1985; Smilor 1987), or more generally a lack of resources that are critical

to their survival (Grimaldi and Grandi 2005; Schwartz and Hornych 2010). Bøllingtoft and Uihøi (2005) add that the absence of administrative support and high initial operational costs are typical barriers for the early development of a new business. Such as yet under-developed internal resources make some entrepreneurs resort to incubators (Klofsten and Mikaelsson 1996), which provide them with access to a pool of resources and capabilities otherwise beyond their reach (Peters et al. 2004; Soetanto and Jack 2013). Thus, business incubators can be seen as tools to create a positive and nurturing environment for small business to develop their ventures and overcome their liability of smallness (Aerts et al. 2007; Allen and Rahman 1985; Bruneel et al. 2012).

The *liability of newness* (Kale and Arditì 1998; Schwartz and Hornych 2010) refers to the start-up's lack of visibility in the market, as well as to the lack of connections (business relationships) within a network of resources (Pfeffer and Salancik 1978). At the inception stage, a start-up faces the challenge of proving itself to numerous business actors while the start-up's and/or the entrepreneur's relevant social capital is often still weak. Thus, the firm's brand equity or reputation is often virtually non-existent (Grimaldi and Grandi 2005). This may hinder the development of social and business relationships based on external interaction and exchange processes, such as the establishment of stable relationships with customers, creditors, suppliers, and other organizations. Consequently, accessing important resources such as funding, market channels, or developmental partnerships, may prove difficult. Additionally, the liability of newness can also impact on endogenous processes related to learning new roles, developing trust, and cooperation between organizations (Kale and Arditì 1998). Business incubators are expected to be able to provide effective solutions to this problem by providing credibility and legitimacy (Bergek and Norrman 2008; Bøllingtoft and Uihøi 2005; Salvador 2011).

### ***3. Incubators Settings***

#### **3.1. Business Incubators and Networked Incubators**

Business incubators (BIs) provide “*the social environment, technological and organizational resources, and managerial expertise for the transformation of a [...] business idea into an efficient economic organization*” (Phan et al. 2005, pp. 107). BIs are “*especially designed to hatch enterprises*” (Aerts et al. 2007). The term business incubator is normally used as an umbrella concept to describe a wide range of ubiquitous (Bergek and Norrman 2008) and heterogeneous institutions (Scilitoe and Chakrabarti 2010) in different contexts, with idiosyncratic objectives (Schwartz, 2013). For instance, incubators can be private or public, specialized in an industry or diversified, profit or non-profit-based (Grimaldi and Grandi 2005), and physical or virtual (or a combination of both) (Durão et al. 2005). Due to their diverse nature, a variety of organizational missions,

structures, processes and resource flows can be expected (Becker and Gassmann 2006). Within this universe, Networked Incubators (Hansen et al. 2000) emerge as a particular type of BIs which is of particular interest to our study.

Networked Incubators (NIs) are a specifically set-up to provide access to an extensive and valuable network of resources, knowledge, and legitimacy that can be used and leveraged by the start-up tenants in the NI; these networks can be accessed both internally within the NI and also externally (Hansen et al. 2000; Hughes et al. 2007; Soetanto and Jack 2013). In the latter case, NIs perform a “*boundary-spanning function in facilitating access to different types of resources and service providers through institutionalised networks*” (Brunnel et al. 2012, p. 117). In NIs, networking is institutionalized; thus, networking mechanisms promote business relationship building even before the start-ups need these, thereby allowing entrepreneurs to take advantage of those mechanisms rapidly. As a result of this routinization, networking is less dependent on specific individuals or entrepreneurs’ personal connections, and it can be expanded to include numerous companies or other actors (such as regulators, policy-makers, research institutions) in many different sectors (Hansen et al. 2000).

Within BIs (NIs included), service and incubation processes may differ according to their base of customers and available resources (Grimaldi and Grandi 2005), contextual factors (e.g. industry, national innovation systems, life cycle and newness grade of innovation) or stakeholders with different and possibly divergent expectations (Abetti 2004; Mcadam et al. 2006). Thus, one way to differentiate different incubator types is to classify them by their incubation service activities, i.e. the kind of support they provide to start-ups.

### **3.2. Dimensions of Incubator Support**

Smilor and Gill (1986) identified two major approaches to define incubator support activities. The first approach focuses on providing office facilities to the start-ups at affordable prices. The second approach focuses on actively supporting the creation and development of new businesses. An incubator may choose to adopt the facility provision strategy, the business support strategy, or a combination of both (Hacket and Dilts 2004; Mcadam and Marlow 2007; Smilor and Gill 1986). In this paper, in line with Bruneel et al. (2012) in their study of the evolution of business incubators, we are grouping incubators’ support offerings into the following categories: infrastructure, business support, and network support. Following Schwartz (2013), we are also considering a fourth category, i.e. legitimization/credibility that relates to the reputational benefits that start-ups may accrue from being affiliated with the BI’s brand (Grimaldi and Grandi 2005; Salvadorm 2011). The four types of support are detailed below.



### 3.2.1. Infrastructure Support

One approach focuses on providing facilities such as office space to the start-ups at affordable prices (Smilor and Gill 1986). It can also include shared administrative and other support services (Bergek and Norrman 2008) such as reception, clerical services, meeting rooms, conference rooms, car parking (McAdam and McAdam 2008) or energy, water, telecommunications and cleaning (Bruneel et al. 2012). The strategy is primarily a real estate-related one, and success is defined in terms of space occupation rates and space rental yields (Smiler and Gill 1986). This turnkey solution offers economies of scales that results in reduced overhead costs; it also takes the need to manage these daily non-core activities away from the start-ups, allowing them to concentrate on the development of their business (Bruneel et al. 2012).

### 3.2.2. Business Support: Management and Technical Support

Business support can entail the provision of resources and activities that are likely to help developing start-ups' businesses. This may include access to technological facilities (e.g. laboratories), information technologies, or sources of funding, services such as business counseling, public relations, recruitment, accounting and legal counseling, or pooled purchasing (Bøllingtoft and Ulhøi 2005; Hansen et al. 2000; Soetanto and Jack 2013). Such services can aim at reducing the start-up's costs, e.g. shared IT purchasing leading to a lower price. Other services can focus on helping develop the start-up business: like managerial support counseling or entrepreneurial training and coaching (Bergek and Norrman 2008; Bruneel et al. 2012).

Overall, the business support offered by the business incubator management team to the start-ups can be categorized to fall into two basic types (Scillitoe and Chakrabarti 2010): *management support*, and *technical support*. Management support relates to generic dimensions such as business planning, fiscal support, staff recruitment, and access to capital or business contacts (as O'Gorman et al. 2008 exemplify). Technical support consists of providing access to specialized technical knowledge or infrastructure, or to scientific knowledge created by, for example, universities. Relating to business support, incubators' success is defined according to the success and expansion of the new businesses, namely their sustainability after the incubation period (Ahmad and Ingle 2011).

### 3.2.3. Networking Support

Bollingtoft and Ulhoi (2005) emphasize that incubators should focus on developing a network of businesses that can help start-ups survive in the long run. For example, the incubator may work as an intermediary between the start-ups and a network of external potential partners, such as customers and suppliers, providers of specialized services, financial and funding institutions or research facilities (Schwartz and Hornych 2010; Sofouli and Vonortas 2007).

Networking support by the incubator therefore reflects its focus and capacity to promote and nurture relationships amongst tenants (Hasen et al. 2000), as well as between tenants and external entities (Bruneel et al. 2012). In an incubator context, networks based around business relationships are thus expected to create value to the start-ups in several different ways, namely by providing 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 generation of collective learning (Lorenzoni and Lipparini 1999; McAdam and McAdam 2008); these networks can also achieve economies of scope, resulting from a joint utilization of resources (Panzar and Willig 1981). Networking in incubation settings has thus been described in the literature as a decisive factor of success for the incubation process, especially in the context of NIs (Hansen et al. 2000; Hughes et al. 2007; Rothschild and Darr 2005; Scilitoe and Chakrabarti 2010).

#### *3.2.4. Legitimacy/Credibility Support*

Besides the infrastructure, management, and network support functions, a start-up can further benefit from joining an incubator. The relationship between a start-up and an incubator can work as a type of certification, thereby helping start-ups to overcome or minimize the usual initial lack of credibility *vis-à-vis* customers, suppliers, partners, or sponsors (Akerlof 1970). It has to be noted that the affiliation of the incubator with respectable external partners (such as leading universities) works as an additional certification to the start-ups' quality (Grimaldi and Grandi 2005). Additionally, the business incubator's brand may work as a reputational signifier for the start-ups (Salvador 2011): the association with the incubator brand may enhance the start-up's legitimacy as an actor in a market (Smilor 1987). Incubators may also assume a mediation role between the external partners (either business or institutional) and the start-ups, thereby contributing the enhancement of the latter's visibility, credibility, and legitimacy (Bergek and Norrman 2008). In our paper, legitimacy/credibility is mostly related to possible reputational benefits that start-ups may accrue from being affiliated with an incubator.

While these four types of support may co-exist in the same incubator, there has been a shift in the focus of BIs, from real estate providers, to developmental and support incubators (Aerts et al. 2007). Over the last years, incubators have been putting increasing emphasis on intangible and high-value services, such as the "*access to external resources, knowledge and legitimacy*" (Bruneel et al. 2012, p. 113). This led to the development of new incubating models (Grimaldi and Grandi 2005), such as the NIs (Hansen et al. 2000). Still, defining the incubators' value to start-ups is an important step to understanding their impact on the incubated firms (Bruneel et al. 2012).

#### **4. Assessing the Value of Business Incubators**

As more public and private resources are invested in business incubators, it is imperative to assess “*what return society gets on these investments*” (Bergek and Norrman 2008, p. 21). 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 a massive range of data to determine if the survival rate of new initiatives would be different if companies had not been incubated (Schwartz 2013). Also, as McAdam et al. (2006) point out, there is no consensual definition on what constitutes a successful incubator. Several authors (Ferguson and Olofsson 2004; Lofsten and Lindelof 2002) have identified performance measures, such as tenant success, graduation and survival rate, jobs created, sales growth and profitability. For university technology incubators, Mian (1996, 1997) adds indicators such as program growth and sustainability, contributions to sponsoring the university’s mission, and community-related impact.

One of the difficulties in evaluating a incubator performance stems from the fact that value can be created and measured at different levels, for example, at the overall incubator level as well as the start-up level (Clausen and Kornliussen 2012; Scillitoe and Chakrabarti 2010). At the incubator level, performance is related to the extent to which its management model is able to respond to the expectations held by both the incubator’s promoters and funders, and the entrepreneurs (e.g. Mian 1997). At the start-up level, incubator performance can be evaluated in terms of its contribution to the start-up development through the provision of adequate support functions, that is, how much value it delivers to the start-up. Existing studies show that shared services (Mian 1996, 1997), and the infrastructure element (Bergek and Norrman 2008; Voisey et al. 2006) are amongst entrepreneurs’ most valued factors. Thus, an entrepreneur’s decision to locate a start-up in a specific business incubator is linked to his/her expectations regarding the start-up-related value this incubator will deliver; these expectations may or not be fulfilled, according to the level of ‘customer’ or tenant experiences (see for example Ahmad and Ingle 2011).

Although there has been a shift of focus in the study of incubator performance from an incubator perspective to a start-up-related value view (Aaboen 2009; Ahmad and Ingle 2011; Bruneel et al. 2012; Clausen and Kornliussen 2012; Hughes et al. 2007), the value of incubators as perceived by the entrepreneur is not yet fully understood. Thus, in this study, we will focus on *start-up-related value of business incubators*. We use the concept of *perceived value as the juxtaposition between the entrepreneur’s expectations of the incubators’ ability to provide the support he/she considers relevant, and his/her level of satisfaction with the incubation support*, in line with Grimadi and Grandi (2005) and Clausen and Kornliussen (2012). We thus follow Ahmad

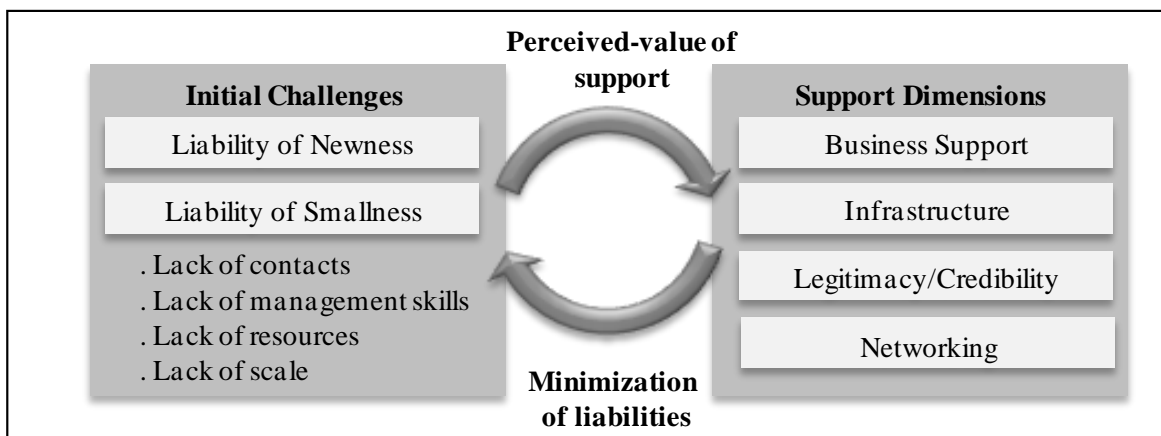
and Ingle (2011, p. 641) in that “*the ultimate judges of the value of business incubation are the client firms and the entrepreneurs who run them – the incubator customers*”.

## 5. Research Framework and Design

### 5.1. Networked Incubator Value-adding Framework and Research Questions

The main theoretical support concepts discussed above inform our synthesis of a conceptual framework of the value-adding aspects of a NI from the incubated entrepreneur’s perspective (see figure 1). The value potential provided by the NI relates to the support dimensions that start-ups need and look for in an incubator to overcome their initial challenges, namely the liabilities of smallness and of newness. The support provided by the incubator can be analyzed along four dimensions, as introduced above: infrastructure, business support, legitimacy/credibility, and networking.

**Figure 1** Potential of Value-adding Support by the Business Incubator



In line with the concept of perceived value, an entrepreneur chooses and assesses a specific incubator based on expectations regarding the incubator’s potential to provide value along the four support dimensions. However, the existing literature offers limited clarity regarding these expectations. Thus, in line with our state research aims, the first specific research question is: (Q1) “*What are the expectations which entrepreneurs have when choosing a business incubator?*” Based on our framework, we capture the four support dimensions outlined in Figure 1: Business Support, Infrastructure, Credibility/Legitimacy and Networking. Moreover, we are also interested in the specific perceptions held by entrepreneurs on the value they actually receive from the incubator. 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?*”. Again the four support dimensions provide a dimensional framework for this issue.

Additionally, given that networking is considered a crucial aspect in business incubation, especially for a NI as in our case study, we analyze the particular issue of the network dimension specifically by identifying what types of relationships are established within the incubator. Thus, our third research question is: (Q3) “*What is the nature of networking (network relationships) as part of the business incubator?*”. This is in line with Bøllingtoft and Ulhøi (2005, p. 275), who claim that we do not know “*much about the nature of Networking - do formal or informal networks dominate? Or both? And in what areas*”. Finally, we aim at understanding how factors such as participation in networking activities, physical proximity, complementarity between the start-ups, inhibit or enhance networking (Aaerts et al. 2007; Schwartz and Hornych 2008), and therefore formulate our last research question, (Q4) “*How does networking evolve in a business incubator?*”

## **5.2. Methodology and Research Design**

A multi-company case study method was adopted (Yin 2009), combining qualitative and quantitative techniques. Our case study relates to a specific university incubator: UPTEC - the Science and Technology Park of the University of Porto, and all its tenant ventures. According to exploratory interviews within UPTEC and to secondary data (for example, UPTEC internet sites and internal documents), UPTEC fits 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; it organizes regular formal and informal networking events targeted at the start-ups and/or external actors, and puts a continuous effort on matching potential partners within the community of the start-ups as well as with outside partners. When data was collected between March and June 2011, UPTEC housed around 100 tenant firms, of which ten are considered by the Bi as ‘anchor firms’. ‘Anchor firms’ are big external firms and research centers that are located in UPTEC for two reasons: to strengthen their connections with the University of Porto, and to help with the development of start-ups, e.g. by buying their products or services. Tenant firms are clustered into four groups: Biotechnology, Creative Industries, Sea, and Technology, scattered across four different locations. UTEC therefore offered a rich and diversified incubation context that fitted our research goals. The main study included only the start-ups that had joined UPTEC at least four months before the data collection commenced; the purpose was to include only start-ups that had been in the incubator long enough to make networking possible. With the help of the UPTEC management team, 77 firms were identified that fitted this criterion, out of which 58 agreed to participate (response rate of 75.7 per cent). The distribution of the 58 tenants between the cluster was the following:

Biotechnology: 6 firms (of which 1 is an ‘anchor’ firm); Creative Industries: 16 firms (3 ‘anchors’); Sea: 3 firms; Technology: 33 firms (1 ‘anchor’).

Primary data was collected through a mixed methods approach: a survey, including specific social network analysis (SNA) sections, was supplemented by semi-structured interviews with the entrepreneurs. Interviews were also conducted with the incubator board and management team, which allowed us to understand the context and current status of the incubator, as well as how networking was dealt with and promoted by the NI. The combination of quantitative (SNA; Haythornthwaite 1996, Scott 2000) and qualitative techniques (content analysis; Krippendorff 2004) allowed us to understand the outcomes of the incubation process, as well as the processes that led to those outcomes (Tellis 1997). Thus, we respond to the need of qualitative studies that improve our “*understanding of the complexities associated with networks and how these impact on incubator firms*” (Soetanto and Jack 2013, p. 450). Our respondents (both for the interviews and the survey) were the 53 entrepreneurs (i.e. founders or general managers of the start-ups) and the general managers of the five ‘anchor’ firms.

One part of the survey was built around the levels of expectations and satisfaction regarding the four support dimensions identified in our conceptual framework (Figure 1) and thus addressed research questions Q1 and Q2. In this context we excluded anchor firms as they are not located in UPTEC for incubation purposes; thus, only the 53 entrepreneurs are considered. We operationalized the four incubator value dimensions as follows: In relation to ‘Business Support’, we asked respondents about the ‘Management Support’, as well as about the ‘Technical Support’ offered by the UPTEC’s management team (Scillitoe and Chakrabarti 2010). For ‘Infrastructure Support’, we included two factors: turnkey facilities, and facilities rent (Aernoudt 2004). We analyzed the ‘Legitimacy/Credibility’ dimension through the assessment of the importance of the UPTEC Brand, as well as the University of Porto Brand. Finally, ‘Networking Support’ was considered at internal and external levels (Bøllingtoft and Uihøi 2005; Bruneel et al. 2012). Internal networking was related to questions regarding joining the incubator in order to develop relationships with other start-ups. Internal networks are considered particularly useful as they enable tenant companies to share all kinds of resources. Lyons (2000) believes that the opportunity for networking with other start-ups is the most important service offered by the incubator. External networking covered two factors: support to create external relationships, and access to the University of Porto network. We treated the access to the university network separately, given that access to academic facilities and specialized knowledge is considered a University Incubator specific form of value creation (Grimaldi and Grandi 2005).

We measured expectations regarding these dimensions by, first, asking entrepreneurs about how important these factors were in their decision to join UPTEC. A five point semantic differential scale was used to measure importance (anchored in 1- not important at all; 5- very important). Secondly, entrepreneurs were asked to evaluate their satisfaction with each of the factors in relation to their initial expectations; again a five point semantic differential scale was used (1- not satisfied at all; 5- totally satisfied).

Research questions Q3 and Q4 focus specifically on understanding networking-related aspects of the incubator. To address Q3, entrepreneurs were asked to indicate on five-point scales the perceived frequency (anchored in 1- rare; 5- very frequent) 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. These networking activities were measured at each at the following 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, or sell to'); joint R&D projects; and co-development of products, services or processes. These levels were defined after a preliminary interview with the UPTEC management team and an entrepreneur from an incubated company, who helped us identify all the relationships that could take place within this specific NI. The study of interactions was restricted to tenants, UPTEC, and the University of Porto, as the inclusion of all start-ups' external partners would have been too complex and not feasible as part of this research project; moreover, the pre-study had established that networking was primarily seen by entrepreneurs as an internal activity including university departments. Finally, also using five-point semantic scales, we asked entrepreneurs about the usefulness they attributed to the networking events organized by UPTEC's management team (anchored in 1- not useful; 5- very useful), and how often they attend those events (1- rarely; 5- very frequently). After completion of the survey, all respondents were interviewed and asked to further elaborate on their survey answers; this provided us with a more complete and contextual understanding of the networking processes.

Data was analyzed using different techniques. Survey data was analyzed using descriptive statistical techniques. Additionally, data pertaining to interactions (Q3) was analyzed using Social Network Analysis techniques, supported by UCINET 6.0 (Borgatti and Everett, 1992). This allowed us to understand the structure and patterns of networking interactions in the NI (Skerlavaj and Dimovski 2006). In order to understand the underlying causes and processes leading to the identified structure and relational patterns (Q4), all interviews were transcribed and content analyzed.

## 6. UPTEC Case Analysis, Findings, and Discussion

The discussion of analyses and findings is organized around the different research questions. Table 1 provides an overview of data regarding research questions Q1 and Q2. Only answers showing higher levels are displayed (corresponding to points 4 and 5 on the scales, labeled ‘rather important’, and ‘very important’, respectively, for expectations; and ‘quite satisfied’, and ‘totally satisfied’, respectively, for satisfaction).

**Table 1** Relevance and Satisfaction Regarding Support Dimensions

Dimensions	Factors	% of 4-5 answers (rather and very important)	% of 4-5 answers (quite and totally satisfied)
Infrastructure	Turnkey facilities	72%	70%
	Facilities' rent	70%	52%
Business support	Business support provided by UPTEC's management team	48%	35%
	Technical provided by UPTEC's management team	37%	26%
Legitimacy	University of Porto brand	83%	80%
	UPTEC Brand	65%	70%
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%

### 6.1. Discussion Q1. “What are the expectations which entrepreneurs have when choosing a business incubator?”

As Table 1 shows, several of the incubator value dimensions previously identified in the literature (i.e. ‘Business Support’, ‘Infrastructure Support’, ‘Legitimacy/Credibility’ and ‘Networking’) are considered by entrepreneurs as being rather important, or very important. Only three factors or sub-dimensions, namely ‘technical support’, ‘management support’ (both pertaining to the value dimension of ‘Business Support’), and ‘considering existing start-ups’ (pertaining to the ‘Networking’ dimension), were not deemed to be important by the majority of the respondents. Thus, our work does not support the idea that the acquisition of tangible resources is the strongest motive to being located in an incubator, as suggested by Soetanto and Jack (2013).

It is interesting to note that the connections with the University are highly valued in terms of expectations, not only because of its associated brand (which may add to the start-ups’ legitimacy), but also because of the University’s network that may be accessed through the incubator. In terms of ‘Legitimacy’, it is clear that the entrepreneurs value the university brand more highly than the incubator brand. ‘Infrastructure’



factors were also considered as important aspects, confirming the importance attributed by entrepreneurs to cost and operational issues.

At the level of the 'Networking' value dimension, an important finding is that companies that indicated internal networking as key in their decision for choosing UPTEC, also consider external networking as important: entrepreneurs who had high expectations regarding the possibility to develop valuable relationships with other incubated firms were also strongly interested in using UPTEC as a lever for the creation of relationships with external actors, namely with the University of Porto's network. We must note that the importance granted both to external networking (University and other external partners) and internal networking (with other tenants) as a location criteria was found to be much higher than what Soetanto and Jack (2013) found in their study, suggesting that UPTEC start-ups have a strong network-oriented profile. However, the results are partially 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 percent of the respondents as an important expectation regarding 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. This finding contradicts Schwartz and Hornych's (2008) work, who claim that when assessing an incubator in the selection stage, prospective tenants consider amongst other factors the identity and features of the existing tenants (i.e. future fellow tenants). This would allow future tenants to be better informed regarding the value that they can actually get in terms of networking by joining a specific incubator.

## **6.2. 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 (that is, 'Legitimacy'), and to a lesser extent 'Infrastructure' (namely regarding the provided 'turnkey facilities'), it is clear that the incubation process within UPTEC did not meet most entrepreneurs' initial expectations regarding the incubation value for their start-ups (see Table 1). Moreover, when satisfaction is related to factors with a stronger relational nature, the evaluations reach the lowest values. Results show an overall lower satisfaction with 'Networking' value (external and internal) and with 'Business Support', compared to other dimensions. These results are replicated in all sub-dimensions of these two value dimensions, and are therefore providing evidence for a structural shortcoming in the NI. This corroborates the idea that for satisfaction considerations an understanding of what the incubator offers in terms of support activities is not as critical as the extent to which that potential is being used (Hughes et al. 2007).

In the specific case of university incubators such as UPTEC, O’Gorman et al. (2008) state that the management team’s ability to develop external networks is an important determinant of incubator effectiveness. Although UPTEC states that networking support is one of its core activities, evidence shows that tenants’ expectations regarding this dimension are not being fulfilled. Therefore, there may be a misalignment between the networking connections that the incubator makes available to the tenant companies and what the latter expected it to provide. Such issues of alignment between the incubator support activities and their tenants’ profiles have been identified in the literature as being core for incubator effectiveness (Bruneel et al. 2012). Our findings may also reflect the incubator management team’s lack of capacity to promote networking activities and relationship development (Ahmad and Ingle 2011; Hughes et al. 2007), or the tenants’ unwillingness or lack of capacity to use the support services that are made available (Hughes et al. 2007).

In summary, to understand issues around ‘Networking’ value, which represents an important aspect of entrepreneurs’ expectations as well as a crucial aspect of the NI’s value proposition, some additional analyses are required. These are carried out below, in the context of the next two research questions, where we look further into the “Networking” dimension of the NI.

### **6.3. Discussion Q3. “What is the nature of networking (network relationships) as part of the business incubator?”**

The UPTEC network was analyzed on several relational levels<sup>2</sup>. The aim was to evaluate resource pooling activities and knowledge acquisition activities (Hughes et al. 2007), as well as interpersonal contacts that “*can provide opportunities to share thoughts, feelings and values*” (Ahmad and Ingle 2011, p.635). This would allow us to evaluate if “*high quality relationships*” between tenants would foster knowledge sharing, leading to project collaborations (Soetanto and Jack 2013, p. 438). The relational analysis levels were as follows: social contacts, technical counseling, business counseling, commercial exchange, joint R&D, and joint development of processes, products or services. To understand the characteristics of the relational network along those levels, we analyzed *network density* and *relational intensity* (Kilduff and Tsai 2003; Scott 2000). Network density is a ratio between the relationships that actually exist, and all the relationships that 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 contacts between connected actors (Kilduff and Tsai 2003). To measure intensity, we used a five point scale ranging from 1 - very rarely, to 5 - very frequently. Both density and intensity measurements were applied to all relational levels,

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<sup>2</sup> As we intend to understand the entire networking patterns within the incubator, the analysis of Q3 and Q4 includes the start-ups and the anchor firms.

thereby providing us with an idea of the extent to which the networks' relational potential was being exploited. Table 2 shows the density for each considered relational level. We have included the measures under two different scenarios: including the UPTEC management team, and excluding the team. The second scenario allowed us to assess the networking amongst tenants only.

**Table 2** Density Analysis Concerning Relational Levels

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

The UPTEC network displays a low level of density of relationships in all relational dimensions. The highest density was observed for social contacts: 11.18 per cent; all remaining relational levels displayed a density level below 3 per cent. This means that few of the possible relationships within the incubator were in fact established. As such, resource pooling and sharing as well as interactions to acquire knowledge, are rare activities amongst the start-ups, which limits start-ups' potential to exploit the network (Hughes et al. 2007). In a study carried out by Honig and Karlsson (2010), where the authors compared the density of the networks for incubated and non-incubated companies, findings show that the networks for the former presented significantly higher levels of density than the latter. In line with this work, and although we are not considering non-incubated companies, our initial expectation was that the UPTEC tenants' network would present a higher density.

Adding the UPTEC management team to the picture did not produce relevant differences. Still, at the level of social contacts and counseling, the inclusion of the UPTEC management team made the network slightly denser. This is in line with Honig and Karlsson's (2010) work which points to "*the source of [tenants'] most important contacts (the incubator manager) and referencing the incubator manager himself as a key important person in the business*" (p. 721).

In order to better understand the characteristics of the NI network, we re-calculated the network density by adding an intensity restriction: We only considered those relationships that had a frequency higher than 2 on the 5 point scale. This allowed us to exclude sporadic relationships from the analysis. Table 3 illustrates the results of this analysis.

**Table 3** Density Analysis (With Intensity Restriction)

Analysis Level	Average density		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
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 from	0.0154	0.0150	0.0062	0.0060
Sell to	0.0140	0.0180	0.0044	0.0047
R&D	0.0055	0.0053	0.0014	0.0013
Joint process/prod/serv. development	0.0133	0.0133	0.0038	0.0037

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 made the network density drop considerably on all relational dimensions. As such, networking does not seem to have an expressive or solidified existence in this NI. Social contacts represented the only level where networking could be considered of some relevance. This is in line with the study by Schwartz and Hornych (2010) that also identified informal relationships as the predominant interactions within incubators. The fostering of social networks and the support for social capital has been identified in the literature as a main *raison d'être* of incubators (Collinson and Gregson 2003). The UPTEC management team is (as expected) apparently a particularly well-connected actor at the social level, in line with the idea put forward by Ahmad and Ingle (2011) that relationships between the management team and the tenants are not 'strictly business'.

Overall, our results strengthen the existing knowledge of the dominance of interactions of informal/social nature within business incubators. Moreover, the low density scores that resulted from the analysis corroborate the idea that business incubators, even those of the networked variety, hold a limited ability to foster formal and more business-oriented relationships between their tenants. However, we cannot conclude from these results that the low intensity of networking taking place within this incubator is (solely or predominantly) due to the management team’s incapacity to promote networking.

Social contacts are frequently considered as a possible enabler of other types of interactions, i.e. of a more formal and business-oriented nature (Cooper et al. 2012; Honig and Karlsson 2010; Rothschild and Darr 2005). Moreover, informal relationships have been identified in the literature as a powerful source for opportunity identification (Singh, 2000), which is then followed by exchanges of relevant information and the discussion of cooperation potential, and in some cases taken forward and institutionalized (Kreiner and Schultz 1993). Given the importance that social relationships play, together with the observed predominance of the social contacts in UPTEC, we analyzed the correlations between social contacts and other types of relational networking (as shown in Table 4).

**Table 4** Correlation Analysis between Social Contacts and Other Relational Levels

Social contacts and...	Pearson’s Correlation	
	Correlation	Significance
1) Ask for business counseling	0.479	0.000
2) Ask for technical counseling	0.428	0.000
3) Co-development	0.165	0.000
4) R&D	0.178	0.000

Results show that the correlation with social contacts is relevant only for contacts aimed at technical or business counseling. 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. This contradicts existing literature: social capital was expected to promote the identification of opportunities for more formal business interactions (Aldrich 1999; Birley 1985; Honig and Karlsson 2010), or even more specifically the co-production of emergent technology (Rothschild and Darr 2005). However, similar findings to ours were made by Schwartz and Hornyh (2010), who observed in their study how despite the predominance of social relationships, no relevant formal interactions were observed.

Networking can thus be described as scarce at UPTEC, with low density and low intensity levels, despite the incubator's considerable networking support offered by the incubator management, in line with its characteristic as a NI. It is therefore important to understand the reasons why this networking potential was not translated into value for the start-ups.

#### **6.4. Discussion Q4. "How does networking evolve in a business incubator?"**

We used content analysis of the interviews to gain an initial understanding of the networking evolution and of what entrepreneurs perceive to be the main barriers to networking. This was complemented by another SNA analysis relating to one of the identified barriers (i.e., geographical distance), as well as for one networking-enabling factor (i.e. participation in networking events). It is important to emphasize that in line with the survey results the majority of respondents stated an *a priori* willingness to network with other companies incubated at UPTEC. The value of interactions was recognized by these entrepreneurs, for example in statements such as "*all this potential of the companies that are here could provide an exchange of ideas, experience and knowledge*"; or "*networking is very important for any company at its starts because nobody can win alone and these relationships are supposed to be an advantage*"<sup>3</sup>. Thus, it was not due to a lack of appreciation of the networking value that start-ups did not interact further with each other. A further analysis of the interviews helped us to identify some enabling factors and also the reasons why this appreciation did not result in actual interactions.

##### *6.4.1. Lack of Information about the Other Actors*

A first identified barrier to networking was the start-ups' lack of mutual knowledge about each other's businesses, both within and between clusters in UPTEC. Most respondents pointed out that this 'ignorance' was a deterrent to the establishment of partnerships or interactions. In fact, tenant entrepreneurs largely ignored each others' specific projects, activities, resources, or expertise. As one respondent claimed "*we still need to go a long way, until we will communicate more with each other... and knowing who is here, who went away, who will join, what one makes*". Another respondent opined that it was important and necessary to "*know well who is incubated and the profile of the people*". The incubator management's team may have an important role to play here, e.g. in facilitating and fostering the mutual knowledge between tenants by instigating a communication-enabling environment between tenants, which can result in an increased level of cooperation activities (Schwartz and Hornych 2010) and interactions to bridge expertise gaps (Durão et al. 2005).

##### *6.4.2. Incubator Size*

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<sup>3</sup> This and the following quotes are excerpts of the interviews conducted with the entrepreneurs.

Some of the entrepreneurs that joined UPTEC at its inception stage relate this ignorance to the current incubator's size, which grew exponentially over the last years. 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 other in 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 with only three companies. This fact may constitute an additional indicator of the importance of the incubator size to the development of social interactions and mutual knowledge. These findings seem to contradict previous evidence found by Schwartz and Hornych (2010) regarding a positive influence of incubator size, measured as the number of incubated firms, on the propensity to engage in commercial interactions and technological cooperation. Moreover, our findings regarding incubator size corroborate only partially previous results, namely the work by Aerts et al. (2007), who found an inverted-U shaped relationship between incubated firm performance and incubator size. According to these authors, small size and big size incubators can offer certain support with the associated value for the tenants that medium size incubators are not able to, being thus characterized by a higher failure rate. Our study corroborates the notion that small incubators *"can closely follow up the tenant companies and personally guide them through their growth process"* (Aerts et al. 2007, p. 263), promoting closer and stronger informal and personal ties between the incubator team and tenants, as well as between tenants. However, our study does not show any evidence to support the achievement of economies of scale, or the development of a professional culture resulting from the incubator's exponential growth, resulting in more value to start-ups and consequently higher success rates.

#### 6.4.3. Space Configuration

A third aspect that was widely reported by respondents concerned the configuration of the UPTEC space. Several interviewees stated that the relationships they had were mainly with companies located within their vicinity. As one respondent explained, *"we ourselves related more with the people from this floor that we meet out there"*. The interviews also highlighted that the geographical dispersion of UPTEC across four different locations seemed to make the creation of relationships between the companies from different clusters a cumbersome process. As one entrepreneur claimed, *"there is a large gap between the two clusters [creative industries and technology]. 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 hindered the establishment of social contacts. This seems 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 common living, at least not in this building. There are no meeting spaces... the only space there is...is outside the building*".

Physical or spatial proximity is recognized in the literature as factors that positively influence networking within business incubators (Aerts et al. 2007; Cooper et al. 2012; Durão et al. 2005; McAdam and McAdam 2008; Phillimore 1999). According to Schwartz and Hornych (2010), "*spatial proximity between [business incubator] firms facilitates the transfer of valuable information and knowledge and the exchange of experiences and provides opportunities to work on and acquire certain projects jointly*" (p. 486). Co-location is believed to facilitate informal networking, which can then result in a more formal support network (McAdam and McAdam 2008). Analyses of our data corroborated these considerations: we looked for variations of network density at the social level (i.e. the level where a greater relational density and intensity was observed) within and between the four clusters of incubated companies (i.e. Biotechnology, Creative Industries, Sea, and Technology). Table 5 shows that the highest density occurs in interactions with the management team, independent of the NI cluster in which a start-up is located. Interaction within the clusters is relatively low. The exception is the slightly higher density of the Sea cluster, which is probably due to its small size (three companies) and large physical distance from the other clusters. Inter-cluster density is even lower or non-existent (see Sea-Biotech interactions). These results seem to support findings by Bakouros et al. (2002) who show how spatial proximity is not sufficient to guarantee incubator-internal networking activities or joint collaboration.

**Table 5** Density of Social Contacts (Analysis by Cluster)

<b>Social Contacts</b>	<b>UPTEC</b>	<b>Tecnological</b>	<b>Sea</b>	<b>Creative Industries</b>	<b>Biotech</b>
<b>UPTEC</b>	0	0.821	0.500	0.636	0.600
<b>Tecnological</b>	0.821	0.231	0.030	0.072	0.044
<b>Sea</b>	0.500	0.030	0.400	0.008	0.000
<b>Creative Industries</b>	0.636	0.072	0.008	0.242	0.005
<b>Biotech</b>	0.600	0.044	0.000	0.005	0.133

As our data analysis suggests that network density is higher within clusters than between the clusters, we explored the E-I (External-Internal) Indicator (Krackhardt and Stern 1988), which is used to compare the number of established relationships inside and outside groups (Hanneman and Riddle 2005). The application of



this indicator to UPTEC’s clusters confirms that social contacts are developed mostly within each cluster (see Table 6).

**Table 6** E-I Analysis: Social Contacts Relationships

<b>Social Contacts</b>	Frequency	% Network
Internal	478	0.626
External	286	0.374
E - I Index	-192	-0.251

Considering that in the UPTEC network 63 percent of the 764 existing relationships are internal (i.e. 478 relations), this test revealed an E-I index<sup>4</sup> value of -0.251. This is a clear indicator that at the social contact level, the UPTEC network is essentially formed by relationships within groups - in this case companies located in the same cluster and thus developing business activities in the same general industry. This issue regarding homogeneity of actors and the specialization of incubators will be further discussed below. Similar analyses were carried out for other relational dimensions, confirming the same inward-oriented patterns but with lower density values.

#### 6.4.4. Joint Activities and Networking Events

UPTEC develops a set of formal and informal networking events, performing what Schwartz and Hornych (2010, p. 486) call “*an essential bridging function, bringing together their tenant firms*”. Thus, we wanted to understand the effectiveness of UPTEC’s networking events in attracting tenant entrepreneurs and in producing useful results for their start-ups. We therefore measure the frequency of participation and the perceived usefulness of the events (see table 7).

**Table 7** Participation and Usefulness of UPTEC Networking Events

		<b>Perceived usefulness of UPTEC networking events</b>						
		1. not useful at all	2	3	4	5. very useful	Total	
<b>Frequency of participation in UPTEC networking events</b>	1. rarely	0	1	6	3	5	15	25.9%
	2	0	4	7	3	4	18	31.0%
	3	0	0	3	7	0	10	17,2%
	4	0	0	2	2	3	7	12.1%
	5. very frequently	0	0	4	1	3	8	13.8%

<sup>4</sup> An E-I index of -1.0 would mean that only internal relationships exist, while an E-I index of +1.0 would mean that all relationships are external (Krackhardt and Stern, 1988).

Total	0	5	22	16	15	58	100%
		8,6%	37,9%	27,6%	25,9%	100%	

The majority of the entrepreneurs recognized the potential value of those formal and informal events: 53 percent of the entrepreneurs found them rather or very useful. Regarding one event, a 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"*. Despite the value being attributed to the networking events, frequency of participation is rather low: 57 percent of entrepreneurs rarely attend these events. A correlation analysis between the two variables revealed a very low Spearman correlation coefficient of 0.092: this suggests that perceived value is not related to participation, or *vice-versa*.

Some respondents were disappointed with the outcome of the events they had attended, as they felt that participating in the events had no immediate results. Such a negative perception was especially associated with the informal events. One respondent expressed the view that people *"attend these meetings really in the hope that things will solidify somehow, that if there is a spark, then things will happen by themselves"*. Following these negative experiences, a number of respondents argued that a change in the *modus operandi* of the networking events was required. A few respondents called for a greater formalization of the networking events, making them a stronger part of the routines of the incubation process, even including directive measures by the NI management team. One respondent said: *"I don't know if this is systematized, that is, I think there is still some disorganization and you can't create those links in a systematic way"*, whilst another respondent added that *"there was never any systematization of relationships"*. In addition, respondents also expressed the need to intensify joint activities such as coaching or project application programs, which were mentioned by several participants as being the most productive activities promoted by UPTEC. As a way to intensify knowledge exchange within each cluster, others pointed to the need to create events that were more focused on each cluster's predominant business activity.

Participation in networking activities is expected to favor interactions between the incubated companies (Hansen et al. 2000), thus promoting mutual understanding and the possibility of collaboration (Soetanto and Jack 2013). With this in mind, a SNA analysis was carried out to understand if the network density increased with higher frequency of participation in networking events organized by UPTEC's management team. The resulting analysis (see table 8) revealed a positive relationship between participation in networking events and the establishment of social contacts: the density of the network of ties between tenants that both frequently participated in networking activities (operationalized as scoring a 3, 4 or 5 on a 1-5 scale measuring frequency)

was 22.2%, corresponding to 133 ties, whilst the density amongst the tenants which both did not frequently participate in such events was merely 4.2% reflecting 50 ties. The number of ties emanating from tenants that frequently attended the networking events was also slightly higher than the inverse (i.e. ties emanating from non-participants in interactions with participants): 80 ties (9.1%) against 75 ties (8.6%). This means that actors that participate more often in networking events show a higher density of social interactions than those actors who participate less often. However, this association was not found to be valid for the remaining relationship levels, showing that the networking events do not result in the establishment or development of relationships of a business nature, such as co-development of products, services or processes. Given that social relationships are recognized as an important starting point for the establishment of relationships of a more formal nature (Allen and Rahman 1983; Rothschild and Darr 2005), the networking events nevertheless seem to be fulfilling part of their set role, and resulting business interactions may follow with a time lag.

**Table 8** Density of Social Contacts (and Corresponding Number of Ties) and Participation in Networking Events

<i>Tie recipient</i>	<b>Tenants who did not frequently participate in networking activities</b>	<b>Tenants who participated frequently in networking activities</b>
<i>Tie emanator</i>		
<b>Tenants who did not frequently participate in networking activities</b>	0.042 (number of ties: 50)	0.086 (number of ties: 75)
<b>Tenants who participated frequently in networking activities</b>	0.091 (number of ties: 80)	0.222 (number of ties: 133)

#### 6.4.5. Specialization, Complementarity, and Access to Resources

Whilst spatial proximity is generally considered as a factor that promotes interactions (Durão et al. 2005), results of the influence of business complementarity and homogeneity (i.e., companies doing business in the same area or sector, are sharing markets, or have similar customers, staff know-how; Schwartz and Hornych 2008) are ambiguous. On the one hand, the literature points to specialized incubators as presenting a higher potential for effective results, better internal communication and networking relationships (Schwartz and Hornych 2010). Thus, increased interactions are expected to be observed when there is higher similarity between tenants compared to situations where there is low similarity between incubator start-ups (Aaerts et al. 2007; Bakouros et al. 2002; Bollingtoft and Ulhoi 2005; Chan and Lau 2005; Hansen et al. 2000; Hughes et al. 2007; McAdam and McAdam 2008). In a study conducted by Ahmad and Ingle (2011), it was found that incubators that adopted a homogenous start-up mix base believed that “*a similar client base allowed the pooling*

*of resources, encouraged knowledge and experience sharing and promoted the development of a community that shared a common purpose*" (p. 636). However, other empirical studies show that specialized incubators are not more effective than diversified incubators in terms of networking (Schwartz and Hornych 2010), and some studies even show that high levels of homogeneity in the client base may hinder networking (Ahmad and Ingle 2011).

In the case of UPTEC, interviews revealed that the networking potential was seen as an illusion as the complementarity between start-ups was perceived as being rather low. This means that even if networking processes were more effective, and if both management team and the entrepreneurs performed better in instigating networking activities, not many companies would successfully interact with the others, as they do not perceive each other as holding complementary interests, resources, or activities. One respondent 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 can exist synergies between the companies"*. Therefore, although companies located in the same centre are similar in terms of the nature of their activities (e.g. technology-based, creativity-oriented, thus forming different clusters), tenants do not perceive any similarities or common points of interest with their fellow incubatees that would justify fostering relationships.

In fact, more than one company also expressed a lack of trust in relationships with some potential internal partners: *"I think that companies that are here are either my partners or competitors, and I think this is a barrier for people to talk with each other"*. This is in line with previous work that shows how *"too closely related market segments may impede interaction and have a negative effect on the networking climate within the incubator"* (Schwartz and Hornych 2010, p. 491). Companies feel uncomfortable disclosing proprietary information or business ideas that may be appropriated by other tenants (Ahmad and Ingle 2011; Hughes et al. 2007; Totterman and Sten 2005), a problem that seems to be intensified in the case of specialized incubators (Schwartz and Hornych 2010). Our study corroborates these ideas: although a greater network density was observed within clusters (cf. Tables 5 and 6), which are more homogeneous in terms of tenants' sectors of activity, networking within cluster is still scarce and almost limited to social contacts. It can be argued that this seems to be a consequence of both the ignorance regarding other tenants' business activities, as well as resulting from an unwillingness of sharing important information with potential competitors.

#### *6.4.6. The Role of UPTEC Management Team*

Entrepreneurs' perceptions were so far treated as being the key aspect that impacts on the interaction activities within UPTEC, particularly the lack of a more integrated networking. However, it should be noted that both entrepreneurs and the UPTEC management team are actors within the internal networking processes, and therefore the involvement of UPTEC itself represents an important influence on networking activities. The NI's management team can play an important role in removing or minimizing the obstacles to networking within the incubator (Cooper et al. 2012). For example, the management team can promote and initiate contacts between start-ups, thereby easing the instigation of relationships (Ahmad and Ingle 2011; Hughes et al. 2007; Soetanto and Jack 2013). As mentioned above, NIs may also promote joint activities between the start-ups, providing them with opportunities to get to know each other, and therefore engineer a way to enhance the incubator's social dimension. This reflects the management team's role of potential *relational broker* (Ahmad and Ingle 2011; Bøllingtoft and Ulhøi 2005; Hughes et al. 2007), connecting disconnected parties or clients, and establish sub-networks (Burt 2004). Also, the improvement of networking between the start-ups may require effective communication strategies, supported by a clear understanding of the profile of each incubated firm.

In the UPTEC case, the majority of respondents acknowledged the positive role played by the management team in the networking process. They believed that the UPTEC management team strives to promote the integration of those incubated, namely through the organization of networking events and through the resource/capability endowment and needs matching between firms showing potential for synergies and complementarities. In this respect, one respondent mentioned that concerning a partnership which had developed with another company, "*much of this came about due to that matching...*". Another entrepreneur pointed out that UPTEC aims at creating a fit between companies. However, the same respondent 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 UPTEC management team: "*We need a little oil in this gear for people to meet and know what each one does*".

#### 6.4.7. *The Role of the Entrepreneur*

Although NIs can be said to offer start-ups particularly favorable conditions to network with valuable counterparts (Bollingtoft and Ulhøi 2005), the fulfillment of the networking potential (e.g. to seek or access resources or acquire knowledge) is conditioned by the way entrepreneurs exploit these opportunities created by the incubator (Hughes et al. 2007). Namely, entrepreneurs who actively seek networking opportunities and are more predisposed to engage with the incubator management in the co-production of networking value (Ahmad and Ingle 2011; Rice 2002) are in a better position to create, share, and leverage resources through interactive relationships. Therefore, "*the type of incubation outcome and the value created depends crucially on how the*

*incubating firm behaves*" (Hughes et al. 2007, p. 171). Networking processes and outcomes may thus be affected by the entrepreneurs' willingness to network.

Regarding the level of willingness to engage in networking activities, entrepreneurs in our UPTEC case mentioned three different sets of motivations for being interested in networking activities: need for social support, need for a sense of belonging to a group, and access to resources (Cooper et al. 2012; Pfeffer and Salancik 1978). Entrepreneur-related obstacles that may hinder a start-up to fully exploit NIs networking potential can be related to the entrepreneur's orientation or start-up's managerial issues, such as time constraints, lack of information about other residents or interaction partners, and lack of trust or fear to disclosure proprietary information (Cooper et al. 2012; Hughes et al. 2007). Time constraints are of particular importance, as in the start-up's early development stages, entrepreneurs' attention is mainly concentrated on everyday issues of survival (Autio et al. 2000; Zhara et al. 2006).

In the UPTEC case, the weakness of the networking activities was partially attributed to the entrepreneurs' behavior. Several entrepreneurs recognized their inertia in exploring new relationships and potential synergies. A large proportion of respondents justified this inertia with lack of time and resources to invest in networking. This lack of availability resulted in a weak participation in networking events and in low initiative to interact with other companies on a more formal and business-related level. The lack of availability was justified by the entrepreneurs' need to concentrate on their own business ventures. One respondent explained that, "*we are still very busy developing the various ideas we had for the company*", and another added that "*Honestly... I have been a bad student in this field*". Entrepreneurs' factors were therefore identified in our study as one of the obstacle for networking.

## **7. Conclusion**

### **7.1. Contributions and Implications**

This study contributes to the BIs literature in two main ways. First, we undertake an entrepreneur-centered perspective of the creation of value, and are therefore adding to the growing body of literature that undertakes this view (Aaboen 2009; Clausen and Kornliussen 2012; Hughes et al. 2007). Secondly, by exploring the networking processes within a NI, as well as outcomes, underlying motivations, and key factors that condition the effectiveness of those processes, we contribute to a more granular and network-based view of the business incubator's internal dynamics (Ahmad and Ingle 2011; Hackett and Dilts 2004). This study, additionally adds to the empirical body of research in the area of BI and NI, with the analysis of the case of UPTEC, a university NI.

Based on previous studies, (e.g. Mian 1996; Hansen et al. 2000; Bollingtoft and Ulhoi 2005; Bergek and Norrman, 2008), we developed a framework that integrates the support activities offered by a BI (particularly for the NI type of BIs) in relation to the challenges that start-ups face at their early stages. Drawing on the principle that the extent to which the BI's value offer responds to the start-up needs is a measure of performance of the BI (Autio and Klofsten 1998; Bruneel 2012), this integrative framework is put forward as an effective tool to evaluate BIs' performance. Our research provides valuable insights for business incubators' promoters and management teams: it helps understanding the factors that are critical in entrepreneurs' decision processes of venture location, allowing the adjustment of BIs/NIs' offerings to entrepreneurs' value needs, and therefore enabling an optimized incubator management. Our research also equips entrepreneurs with a tool to assist them in their location decisions.

An in-depth analysis of the networking processes taking place within UPTEC, highlighted the fact that for NIs to be effective on networking, special attention should be given to multiple aspects. First of all, although the tenancy selection process has been identified in the literature as a key aspect to assure incubators' effectiveness (Aerts et al. 2007; Bruneel et al. 2012; Grimaldi and Grandi 2005), our case shows how an apparently effective recruiting policy is not sufficient to ensure effective networking to happen. For example, the willingness and availability of entrepreneurs to network seems to impact the effectiveness of the networking process (Hughes et al. 2007). The management team could have picked up this reality if they had detected potential tenants' low interest in finding out about UPTEC's portfolio of incubated firms before joining the center; most respondents were not interested either in identifying potential complementarities of resources or activities (Schwartz and Hornych 2008). Moreover, although the incubator recruited and grouped into the same clusters a similar-base of customers, thereby looking for the benefits resulting from specialization, the levels of interactions in the NI were still low. However, it may also be that companies are unaware of the potential for complementarity due to their poor mutual knowledge, which may hinder the creation of new relationships (Schwartz and Hornych 2010).

Secondly, the availability of valuable resources and services in the NI is not sufficient to produce value for the start-up; instead, entrepreneurs were found to play a key role in turning the existing resources into valuable capabilities (Ahmad and Ingle 2011; Hughes et al. 2007). As Bollingtoft and Ulhoi (2005, p. 275) put it, "*networks are not given but created by individuals and their social interactions with other individuals*". Despite being a NI, UPTEC presented very low levels of interaction across the several relational categories analyzed. There were almost no relationships involving a greater degree of formal involvement (e.g. trade

relations or co-development) within the incubator. The value expectations regarding the incubation process of this NI as a catalyst for new business relationships is to a great extent not being fulfilled. This reinforces the idea that the alignment between services offered on the one hand, and tenants' profiles (including their relational orientation) on the other hand is key in assuring higher levels of networking. In what concerns the services provided by the incubator, Hansen et al. (2000) reported that a NI should have two key characteristics: the institutionalization of networking, and preferential access to a set of relationships/partners with which partnerships could be formed. As evidenced by our analysis, UPTEC fulfills these characteristics adequately. However, and despite its efforts to organize regular formal and informal events, by the time this study was conducted UPTEC was not yet able to make the participation in those events part of the entrepreneurs' routines. This may be because entrepreneurs show different attitudes towards the value of networking (Hughes et al. 2007). In fact, in our case entrepreneurs that showed *a priori* 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; this points to how the entrepreneur's '*relationship orientation*' is an important moderating aspect of networking behavior (Chell and Baines 2000; Havnes and Senneseth 2001; Hultman and Shaw 2003). However, other factors relating to the entrepreneur, such as time constraints (Cooper et al. 2012), were also found to be associated with low levels of participation in networking activities, and the low level of investment in new relationships.

Thirdly, incubators ought to develop the skills to better explore the strong social bonds traditionally held with tenants (Ahmad and Ingle 2011). Start-ups seem to rely strongly on the management team's connections, yet the management team may lack the skills to fulfill its role of *relational broker* (Ahmad and Ingle 2011; Hughes et al. 2007). As a well-connected actor (the one that is better connected in the network), the UPTEC management team does not seem to be making full usage of its potential as an intermediate between tenants. Whilst UPTEC tries to match the various start-ups with potential internal and external partners, the mechanisms in place are apparently insufficient or inadequate to trigger new relationships (Bøllingtoft and Ulhøi 2005; Hughes et al. 2007). Therefore, it is not only the entrepreneur's attitudes and activities that play a key role in the overall success of the incubation process: NI's management teams also do (Grimaldi and Grandi 2005).

Fourthly, although the literature emphasizes the great importance of social relationships (Aldrich 1999; Honig and Karlsson 2010; Soetanto and Jack 2013), our study shows that these do not seem to ignite other relational levels (except for counseling relationships). The relationships within the incubator were found to be



developed mainly at the level of informal contacts, and even these were found to be quite rare; our study also shows that overall, there is a low correlation between the establishment of social contacts and the establishment of other types of relationships. In fact, we found no evidence of the mutually supportive environment created by start-ups that Soetanto and Jack (2013) found in their study. Thus, while agreeing with these authors on the importance of creating a relationship fostering environment, we suggest that instead of focusing too heavily on promoting social networking events, the management team could instead focus on promoting more formal relationships between actors; the former do not seem to be efficient, mostly due to a lack of systematization and provision of further business-based information.

Fifthly, incubators should consider and integrate into their offerings and practices the fact that reality evolves (Ahmad and Ingle 2011). This dynamic view would allow making the required adjustments to deal with, for example, the exponential growth that was observed for this specific incubator with the substantial increase of tenants and consequent negative effects in terms of (social) networking due to size (Aerts et al. 2007).

Sixthly, although spatial closeness and specialization are commonly identified in the literature (although with exceptions) as being driving networking factors, this does not always seem to be the case (Aerts et al. 2007; Ahmad and Ingle 2011; Schwartz and Hornych 2010). Despite the observed geographical closeness and low diversity of within-cluster client-base, the levels of networking were still very low. Thus, although co-location and specialization may be important in some cases, these are not sufficient conditions.

## **7.2. Limitations and Further Research**

This article treats the start-ups as a homogeneous reality. It assumes that the start-ups included in this study face the same liabilities of newness and of smallness, and that they use the incubator to minimize those liabilities in the same way. However, start-ups may be in different incubation stages, holding different resources (for example, registered brands or patents), or different access to external and valuable actors. Therefore, they may use and value the incubator's resource and activities in a diverse way (see for example Bruneel et al. 2012; O'Gorman et al. 2008; Soetanto and Jack 2013; Vohora et al. 2004). Ignoring these differences is a limitation of our study, and can constitute a future research issue. This project also investigates the networking activities promoted by the incubator management team in its totality. 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 networking events, e.g. their attendance rates, and the resulting networking outcomes could be helpful in understanding if specific event

formats may be more effective in producing specific network outcomes, for example, for the different interaction levels covered in this study.

Additionally, not considering the start-ups' external partners represents also constitute a limitation of this study. First, 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; that is, if those brands are effective tools to grant the start-ups the credibility that they lack. Secondly, it would also be interesting to identify the start-ups' external actors and the nature of their interactions in future research. This would enhance our understanding of the different network strategies developed by the entrepreneurs and the constraints underlying their network strategies within NIs. Finally, the fact that this research is based in a single case study limits the generalizability of its findings. The study of other incubators of similar or different nature (e.g. within and outside a university setting) is needed to confirm if our findings still hold in different contexts.

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