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Take Them by the Hand? Unconsciously Incompetent Entrepreneurs and Incubation Processes

Marijn A van Weele

Utrecht University

Department of Innovation, Environmental and Energy Sciences

m.a.vanweele@uu.nl

Frank J van Rijnsouwer

Utrecht University

Department of Innovation, Environmental and Energy Sciences

F.J.vanrijnsouwer@geo.uu.nl

Frans Nauta

Climate-KIC

frans.nauta@climate-kic.org

Abstract

University-affiliated incubators have been recognized for their potential to turn cutting-edge scientific knowledge into successful new businesses. However, the processes through which resources are transferred to the incubator remain underexposed in scientific literature. Using qualitative data from six European incubators, we explore the question of how resource constraints of entrepreneurs influence resource transfer processes. It was found that entrepreneurs initially expect to be constrained by tangible resources, whereas the incubators mainly perceive intangible (human capital) resources as the main constraints of entrepreneurs. Later, entrepreneurs align with the vision of the incubators. We suggest that entrepreneurs initially do not prioritize the development of business knowledge as they are (1) unconsciously incompetent, (2) hesitant to step out of their comfort zone, and (3) primarily short-term oriented. These three barriers to developing business knowledge were found to strongly influence resource transfer processes. Incubators are highly assertive in the early stages in order to actively guide entrepreneurs in the right direction by forcing them to focus on developing business knowledge.

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Take Them by the Hand? Unconsciously Incompetent Entrepreneurs and Incubation Processes

1 Introduction

Over the past two decades, universities and research institutions have become more entrepreneurial, resulting in an increase of the number of new ventures being spun out (Rothaermel et al., 2007; Mustar et al., 2008). However, these ventures tend to remain small (Callan, 2001). One possible explanation is that technological entrepreneurs suffer from substantial resource constraints; although they may be at the forefront of their scientific field of expertise, they lack the business skills and knowledge that are necessary to translate their ideas into a successful venture (Carayannis et al., 1998; Vohora et al., 2004).

One way to help technological entrepreneurs collect the right set of resources is by creating incubators: organizations that facilitate the process of creating successful small new enterprises by providing them with a comprehensive and integrated range of services (Adegbite, 2001). The resource-based view (RBV) has been applied extensively to identify the support delivered by incubators to tenant firms in their portfolio and to classify support into different categories of resources (e.g., Rothaermel and Thursby, 2005; McAdam and McAdam, 2008). The resources with which tenants are supported may include an established network or advanced physical infrastructure such as laboratories and libraries, credibility, human capital, etc. (Hansen et al., 2000; Ensley and Hmieleski, 2005; Aerts et al., 2007; Dee et al., 2011). Although scholars have intensively tried to identify different resources with which incubators support their tenants, *“little has been written with regard to ... how and in what way incubators provide their support”* (Bergek and Norrman, 2008, p. 23) (i.e., how resources are transferred from the incubator to the tenant firm). As a result, our understanding of the incubation process is still limited (Hackett and Dilts, 2004; Hannon, 2005).

More recent studies have responded to this call for more in-depth studies on underlying incubation processes by exploring more thoroughly the resource constraints of incubated entrepreneurs. Efforts have been made to identify the most important resources that incubators offer to entrepreneurs (e.g., Meru and Struwig, 2011; Bruneel et al., 2012) and provide deeper insights into how the needs of tenants change over time (Chan and Lau, 2005; McAdam and McAdam, 2008). However, these studies do not take the role of the incubator in providing these resources into account. In an exploratory study, Rice (2002) argues that incubators operate with different levels of assertiveness; some incubators provide support for the requests of tenants, whereas others take a proactive approach and expose the tenants to an ongoing review process. This reflects the extent to which the incubator perceives itself as manager of the entrepreneurial process or as external facilitator to a process primarily managed by the entrepreneurs themselves (Bergek and Norrman, 2008). Although Rice’s classification provides useful insights into the different roles of incubators in providing resources, he only addresses the interaction between the entrepreneur and the incubator manager, thereby neglecting the role of the incubator in providing other resources.

With this paper, we aim to contribute to our understanding of incubation processes by connecting these two streams of literature. In doing so, we take a two-stage approach. First of all, this study identifies the most important resource constraints that incubated entrepreneurs perceive and experience. These constraints are then compared with resource constraints of entrepreneurs as identified by incubators. In the second part, this paper explores how incubators solve these constraints by relating the aforementioned resource constraints to the assertiveness of the incubator in transferring resources to tenant firms.

In order to do so, we first develop a framework that serves to interpret our empirical findings by reviewing existing literature on incubators and spin-off processes from an RBV perspective. Empirically, we conduct a multicase study. A total of 67 semi-structured interviews were conducted both with incubator staff and incubated entrepreneurs.

Our main findings are that entrepreneurs and incubators initially have different visions about the most important resource constraints of entrepreneurs. Entrepreneurs initially expect to be constrained by tangible resources, whereas the incubators mainly perceive intangible (human capital) resource constraints. The experienced constraints, as identified by more mature entrepreneurs, align with the incubator's vision. We also found that entrepreneurs initially do not recognize the importance of business knowledge. This was found to strongly influence the processes with which incubators transfer resources. Incubators supporting early-stage ventures with inexperienced entrepreneurs are found to take a proactive role, whereas incubators supporting more mature ventures or experienced entrepreneurs play a more facilitating, demand-driven role. Theoretically, this study contributes to our understanding of the RBV as it shows that entrepreneurs are constrained not only by the lack of particular tangible and intangible resources, but also by factors surrounding resources. For example, entrepreneurs were found to be "unconsciously incompetent"; given their technological background, entrepreneurs are unable to recognize the importance of business knowledge and are therefore hesitant to develop this resource.

The current research helps incubator managers to better understand what resources entrepreneurs expect and also experience as the most important constraints, serving as a guideline for the possible strategies that incubators can pursue to help entrepreneurs overcome these constraints. The outcomes of this study may serve as guidelines for entrepreneurs as well, as it provides them with a better understanding of their own misperception of their resource constraints and the differences between incubators. This will help them to find the specific incubator that will best fit their needs.

The remainder of this paper is structured as follows. We begin with discussing literature on high-tech entrepreneurship and incubators. Second, the research design and methodology are described. We then continue with the results section, which begins with the identification of the most important resource constraints of entrepreneurs and then continues with the processes through which resources are transferred from the incubator to the tenant firm. This paper ends with a discussion and conclusion of the results.

2 Theory

This section develops a framework that will enable us to interpret and understand our data. It starts with identifying the resources that high-tech start-ups need to survive and grow while exploring how incubators support tenants by providing these resources. It then continues with exploring the processes through which incubators intervene in the entrepreneurial process and transfer these resources to tenant firms. Finally, given the international sample used in this study, some relevant contextual factors are discussed.

2.1 Incubator Support: Resources

According to the resource-based view (RBV), firms can be seen as a bundle of resources (Wernerfelt, 1984; Barney, 1991), with resources being “stocks of available factors that are owned or controlled by the firm” (Amit and Schoemaker, 1993, p. 35). A distinction can be made between tangible resources (e.g., office and equipment) and intangible resources (e.g., intellectual property and corporate image). Accordingly, the sustainable competitive advantage of firms lies in their scarce, unique, inimitable, durable, idiosyncratic, non-tradeable, and non-substitutable resources and their unique capabilities to combine and deploy these resources (Amit and Schoemaker, 1993). In contrast to established organizations, which can refer to their past performance, entrepreneurial firms do not have a track record and therefore struggle to acquire the necessary resources as stakeholders do not know if the new venture is trustworthy (Aldrich and Fiol, 1994; Bruton et al., 2010). For high-tech new ventures, in particular, the novelty, uncertainty, and complexity of their technology make it difficult to assess their value and obtain financing. This makes high-tech start-ups a high-risk investment, which is why high-tech start-ups find it difficult to acquire sufficient resources (e.g., Westhead and Storey, 1997; Carpenter and Petersen, 2002).

New firms can suffer from resource constraints when they have not yet established a comprehensive resource base. Incubators can be seen as a means to help high-tech ventures overcome these constraints and acquire the necessary resources that create a competitive advantage. The RBV distinguishes between different types of resources and capabilities that incubators can offer to tenant firms. The following list is not exhaustive, but it provides the most important resources that high-tech new ventures need to survive and grow, and it shows how incubators can support tenants by providing these resources:

2.1.1 Tangible Resources

- *Physical capital* includes the physical technology used in a firm, the firm’s plant and equipment, its location, and its access to raw materials (Barney, 1991). Incubators can provide start-ups with the necessary physical infrastructure by giving them access to office space, a car park, meeting rooms, etc. Moreover, incubators often provide their client firms with administrative services, such as a reception or clerical services (Bergek and Norrman, 2008). University-affiliated incubators can also provide access to specialized physical capital, such as university libraries and laboratories (Quintas et al., 1992).

- *Financial capital* is defined as all of the different monetary resources available for the discovery and exploitation of the venture idea (Barney, 1991). Given the difficulties of high-tech start-ups in attracting funding, incubators can help by providing start-ups with different forms of financial resources. Some incubators take an equity stake in tenant firms through seed capital; others help start-ups in an indirect manner to find external investments by providing advice to start-ups on how to raise money and linking them to external venture capitalists (Costa-David et al., 2002).

2.1.2 Intangible Resources

- *Human capital* is, in this study, not approached from a macroeconomic perspective (i.e., human capital being the aggregate labor force as an important driver of the economic growth of countries), but from a microeconomic perspective. Following Becker (1964), human capital is defined as the skills and knowledge that individuals acquire through investment in schooling, on-the-job training, and other types of experience. Following Scillitoe and Chakrabarti (2010), we distinguish between business and technological knowledge. For university spin-offs, knowledge about the technology often comes from entrepreneurs themselves or from the university. Knowledge of how to start and manage a viable business is often absent in incubated entrepreneurs but can be developed through training programs or coaching by experienced entrepreneurs in the incubator (Carayannis et al., 1998; Chan and Lau, 2005). The proximity to university laboratories and research groups offers easier access to technological knowledge, thereby facilitating the technology transfer process (Acs et al., 1992; Etzkowitz, 2002). Besides experience and knowledge, the entrepreneur's level of ambition is recognized as a form of human capital as well. Although the question of whether ambition can be regarded as a resource is open to debate, scholars agree that a high level of ambition is an important characteristic of successful entrepreneurs (e.g., Davidsson, 1989; Gundry and Welsch, 2001). Given the importance of the individual entrepreneur in early-stage ventures, entrepreneurial ambition in this study is therefore regarded as a form of human capital.
- *Social capital* can be defined as the ability of actors to extract benefits from their social structures, networks, and memberships (Davidsson and Honig, 2003). The entrepreneur's network can give "social access" to resources provided by others and can therefore be regarded as a substitute for critical resources that the actor itself does not control (Adler and Kwon, 2002). As start-ups usually have not yet had enough time to develop their own network, an incubator with an established network can provide significant benefits by acting as a mediator to connect tenants to the outside world (Hansen et al., 2000; Bergek and Norrman, 2008). Tenant firms can thereby gain access to venture capitalists, local governments, potential clients, or specialized technical knowledge. Besides connecting tenant firms to the external network of the incubator, tenant firms can also benefit from interaction with each other (the incubator's "internal network") as they often struggle with similar problems (Chan and Lau, 2005).

- *Credibility*, the “believability” of actors, is determined by their trustworthiness, reliability, and level of expertise (Tseng and Fogg, 1999; Rijnsoever et al., 2012). Credibility can help start-ups to access other resources, such as social and financial capital (Shane and Cable, 2002). New ventures suffering from a lack of credibility can be compensated by being associated with an incubator; it gives tenants status and credibility from which they can benefit when interacting with potential clients or investors (Ensley and Hmieleski, 2005). In this sense, reputation or credibility can help new firms to create legitimacy that again helps to attract other resources and gain a competitive advantage.

2.1.4 The Influence of Tenant Maturity

More recent studies have shown that the way tenant firms make use of the incubator’s resources depends on the tenant’s stage of maturity (e.g., Chan and Lau, 2005; McAdam and McAdam, 2008). As tenants mature, they develop in-house expertise and tend to rely less on the resources provided by the incubator (McAdam and McAdam, 2008). Various models can be used to understand how new ventures develop by distinguishing different phases (e.g., Bessant et al., 2005; Garnsey et al., 2006). This study uses the model of Vohora et al. (2004), which was developed to understand the development of university spin-offs in particular. Although not all start-ups within the current study are university spin-offs, most of them are based on knowledge developed at a university or other knowledge institute, and all of them are active in high-tech industries. The model of Vohora et al. is therefore a highly appropriate model to use in this study. The following phases are distinguished:

- *Research phase*: Knowledge and technology is developed that might be commercially attractive. In order to start any commercial activities, the researcher needs to realize that the technology serves a (potential) market need.
- *Opportunity framing phase*: When an opportunity is recognized, the opportunity needs to be evaluated based on its technology and market potential. When the outcome of the evaluation is positive, the business idea needs the commitment of an entrepreneurial team in order to transform the idea into a viable business.
- *Preorganization phase*: In this phase, strategic plans are implemented for which resources are acquired and competences are developed. An important activity in this phase is obtaining financing as this is usually the key for moving into the next phase.
- *Reorientation phase*: The first revenues are generated in the reorientation phase. During this phase, the company receives feedback from initial customers as well as investors, suppliers, etc., and needs to react and change based on this information.
- *Sustainable returns phase*: In this phase, the company has found an effective business model and ensures further rounds of investments.

2.3 Incubator Assertiveness

Incubators differ not only in the resources with which they support tenants, but also in the processes through which these resources are transferred to tenants. Rice (2002) distinguishes different forms of intervention. Some

incubators take a demand-driven approach, with the entrepreneur taking the lead and requesting the incubator for ad hoc business support if he or she requires it. On the other end of the spectrum, some incubators take a more proactive or even aggressive approach in which the entrepreneur is subjected to an ongoing review process. These differences reflect the incubator's perceived role in the venture creation process; on the one hand, some incubators take a "laissez-faire" approach in which the entrepreneur receives a substantial amount of freedom and is left alone unless the entrepreneur explicitly asks for support. Other incubators have a "strong intervention" approach, meaning that they regard themselves as managers of the venture creation process, proactively guiding the entrepreneur through this process (Bergek and Norrman, 2008). Rice (1992) suggests that proactive forms of intervention are more effective than reactive forms of intervention as the latter tends to focus on short-term problems or crises instead of addressing longer-term issues.

2.4 Context

Incubators are located in different countries, which means that they operate in different institutional environments. Resource constraints may depend on the ability of entrepreneurs to extract resources from their environment and, therefore, on the availability of resources in a particular environment, which differs across regions or countries. For example, the availability of venture and seed capital may vary strongly between countries, thereby affecting the extent to which entrepreneurs are able to attract financial capital (Gnyawali and Fogel, 1994; Bruton et al., 2010). Moreover, the environment might influence the assertiveness of the incubator. Roberts and Malone (1996) show that R & D organizations operating in environments rich in entrepreneurial and venture capital (e.g., MIT in the Boston area or Stanford in Silicon Valley) are able to follow a passive strategy of low support in which they leave support to external agencies (such as venture capitalists). In less favorable environments, R & D parent organizations are required to support spin-offs in a more intense and proactive manner. Although the national context might be of influence, it is not the focus of this study. We do take the national context into account as a potential relevant factor in this research and shall explicitly mention any relevant contextual factors that may arise in the results.

3 Methodology

3.1 Research Design

In line with Eisenhardt (1989), a qualitative multi case-study was chosen as the research design in order to develop a new theory on the incubation of high-tech new ventures. The qualitative approach enables us to gain rich and in-depth insights, whereas the inclusion of multiple cases enables us to explore differences across incubators and create theoretical insights that will tend to be more robust than if the results were based on only one case (Yin, 2009).

3.2 Sample Description

The incubators that were studied in this research are all part of Climate Knowledge and Innovation Community (Climate-KIC). Climate-KIC is an initiative of the European Institute of Innovation and Technology (EIT) that aims to accelerate the transition toward a sustainable society. Climate-KIC has 12 academic partners, eight of which have an incubation program. Six incubators agreed to cooperate in this study. Within the sample of six incubators, most incubators distinguished different phases and incubation programs, resulting in a total of 10 incubation programs. The fact that all incubators were part of the same EU program increased the homogeneity of the sample as all incubators were affiliated with at least one university (although they were not required to have a university as a founding partner), were focused toward high-tech entrepreneurship, and stimulated the emergence and/or growth of high-tech new ventures. Despite the focus of Climate-KIC, the incubators hosted both businesses in the clean-tech industry and in other sectors as well. Three incubators were located in the Netherlands, one in the United Kingdom, one in France, and one in Switzerland.

3.3 Data Collection

Data were gathered through semi-structured interviews. All incubators were visited for a period ranging between 1 and 14 days in order to conduct face-to-face interviews on-site. Although conducting interviews is a time-consuming method, they result in in-depth information and give interviewees the possibility to clarify and explain their answers. When possible, the data obtained through the interviews was complemented with data from written documents, such as annual reports, mission statements, and policy documents. Interviews were mainly conducted with incubator staff and incubated entrepreneurs. When possible, interviews with local investors and technology transfer officers (TTOs) of the affiliated university were conducted in order to provide additional insights. Multiple agents were interviewed for each case to minimize personal bias. Together with the manager of each incubator, a group of entrepreneurs was selected to be approached for an interview. Entrepreneurs were selected in such a manner that the sample was representative (in terms of maturity, sector, and background of entrepreneurs) of the particular incubator. The interviews were structured as follows: Entrepreneurs were first asked to introduce themselves and their company. Incubator staff was asked to introduce themselves as well and describe some basic characteristics of the incubator (such as its size and age). After this initial introduction, the core of the interviews

focused on the resource constraints of entrepreneurs as well as the resources with which entrepreneurs were supported and the processes through which these resources were delivered. Resource constraints were identified both from an entrepreneur and incubator perspective. Entrepreneurs were asked to explain why they joined the

Incubator	Country	Incubator Age (Years)	Industry Specialization	No. of Interviews
1	Netherlands	7	Mechanicals	8 Entrepreneurs
			Information Technology	2 Incubator Staff
			Life Sciences	3 TTOs
2	Netherlands	3	Information Technology	7 Entrepreneurs
			Life Sciences	5 Incubator Staff
			Clean Tech	1 TTO
			Social Entrepreneurship	2 Investors
3	Switzerland	5	Information Technology	8 Entrepreneurs
			Mechanicals	1 Incubator Staff
			Med Tech	2 TTOs
4	France	12	Information Technology	8 Entrepreneurs
			Mechanicals	2 Incubator Staff
			Life Sciences	
5	Netherlands	2	Agriculture	8 Entrepreneurs
			Food	3 Incubator Staff
			Chemicals	1 TTO
6	United Kingdom	6	Life Sciences	3 Entrepreneurs
			Clean Tech	1 Incubator Staff
				1 TTOs

Table 1: Overview of incubators visited and interviews conducted

incubator (i.e., which particular resources they were looking for). This reflected their “expected resource constraints.” Then the same entrepreneurs were asked to look back on their time in the incubator and identify those resources that have been most important to the success and growth of their company, reflecting their “experienced resource constraints.” Incubators were asked to identify what they perceive as the most constraining resources of entrepreneurs (labeled as “perceived resource constraints”). The semi structured nature of the interviews enabled the interviewees to explain their answers and to identify resources or other important characteristics in addition to existing scientific literature. Interviews with entrepreneurs took, on average, 25–35 minutes; the interviews with incubator staff took, on average, 40 minutes. All interviews were digitally recorded and *transcribed verbatim* within three days. After every incubator visit, the interview scheme was reviewed and adjusted if the interviews revealed important information and concepts that were not yet included. For each individual case, data were collected until no new concepts emerged and theoretical saturation was reached (Glaser and Strauss, 1967).

Table 1 provides an overview of the total of 67 interviews that were conducted. Due to time and practical constraints, only six interviews were conducted in the United Kingdom. However, as this particular incubator is a

publicly listed company, more written documents were available, which compensated for the small amount of interviews relative to the other incubators of this sample.

A highly diverse sample of 42 entrepreneurs were interviewed, with entrepreneurs being active across different industries, across different development stages (ranging from entrepreneurs who had just joined the incubator to “graduates”, entrepreneurs who had graduated from the incubator), and across various backgrounds (ranging from first-time ex-student entrepreneurs to senior serial entrepreneurs). As mentioned before, all incubators had at least one university as an affiliate or founding partner, which usually was an institute of technology. Furthermore, three incubators had also created links with established research institutes or large private organizations with significant R & D departments. Given that a large part of the incubated entrepreneurs found their way into the incubator via the incubator’s partners, it is not surprising that over 80 percent of the interviewed entrepreneurs had some kind of technical or engineering background (e.g., mechanical engineering, biomedical sciences, and environmental sciences).

3.3 Data Analysis

In order to provide insights into different perspectives, a distinction was made prior to coding and analysis between data coming from entrepreneurs and data coming from incubators. Entrepreneurs who were incubated at the time of the interview as well as graduates and entrepreneurs who did not yet participate (fully) in the incubation program were grouped as “entrepreneurs.” Incubator management, incubator staff, TTOs of the affiliated university, and investors affiliated with the incubator were grouped as being part of the incubator. Data were coded and analyzed using NVivo, a qualitative data analysis software program. NVivo is particularly useful when information is unstructured and comes from different data sources, as was the case in this study. NVivo allows for a systematic analysis of qualitative data by ensuring that all methodological steps that are taken can be traced back and by helping to minimize any personal biases of the researcher.

Resource constraints were identified and classified based on the various tangible and intangible resources that were identified in section 2.1. Incubators were analyzed by exploring the resources with which tenants were supported as well as the processes through which resources were delivered. .Coding categories were created around the incubator’s resources and dimensions identified in the theoretical framework.

Data were coded and analyzed in two steps. First, every case was individually coded in order to gain in-depth understanding of the resource constraints of entrepreneurs and incubation processes for every individual incubator. When all cases were analyzed, NVivo was used to identify and understand cross-case patterns in order to identify common resource constraints and overarching incubation processes.

4 Results

First, resource constraints are identified both from an entrepreneur and incubator perspective. These perspectives are then compared to explore any (in)consistencies. The second part of this section explores the relationship between these resource constraints and the resource transfer processes used by incubators.

4.1 Resource Constraints

Table 2 provides an overview of the various (sub)resources identified in the theory section and the extent to which entrepreneurs and incubators perceive them as constraints (interviewees could identify multiple resources).

Interviewee	Entrepreneurs		Incubators		
	Expected Resource Constraints	Experienced Resource Constraints	Perceived Resource Constraints		
<i>Tangible Resources</i>					
Financial Capital	16	8	3		
Physical Capital	14	7	2		
<i>Intangible Resources</i>					
Social Capital	External Network	4	15	1	
	Internal Network	3	19	-	
Human Capital	Knowledge	Business Knowledge	4	24	12
		Technological Knowledge	2	1	2
	Ambition	-	-	8	
Credibility		1	1	2	
Total		44	76	30	

Table 2. Entrepreneurs' resource constraints from an entrepreneur and incubator perspective

4.1.1 Entrepreneurs' Expected Resource Constraints

The left column of Table 2 shows a focus on tangible resources with almost half of the entrepreneurs looking for *financial capital* or *physical capital* when they join the incubator. An entrepreneur illustrated this: *"At one point, we decided to start our own business, to go for it. So we quit our job, and we realized we don't want to start the business out of our private homes. We wanted an office to start, a place where we could work on our company."* Furthermore, 21 entrepreneurs indicated that they were not looking for particular resources. They came from a parent organization (often a university) that was either a founding or core partner of the incubator, which made starting in the incubator an obvious step. One entrepreneur illustrated this: *"When you start a new company from this university, this incubator is a pretty obvious choice. All the well-known and successful examples come from this incubator."*

4.1.2 Entrepreneurs' Experienced Resource Constraints

When asked to look back on the resources that have been critical to their success, the middle column of Table 2 shows a strong focus on intangible resources. Entrepreneurs indicated that having access to *business knowledge* (through coaching or training) is most important: *"What was important from the beginning was the coaching. If you don't know anything about entrepreneurship, you have to look for help and for people that have gone through the process, who have created a company."* The incubator's *internal* and *external networks* were also identified as critical resources. Being forms of *social capital*, the incubator's *internal* and *external networks* can be regarded as means to access other resources.

It was found that the incubator's *internal network* fulfilled two main functions. First of all, of the 19 entrepreneurs who identified the incubator's *internal network* as a critical resource, 10 identified that peer-to-peer interaction provided them with access to a great pool of *business knowledge*. Entrepreneurs struggle with similar problems, making the *internal network* a valuable resource: *"Everybody has to deal with customers, the business plan, sales, strategy, the bank, legal matters. So it's very useful to talk about these things."* Second, five entrepreneurs stated that the *internal network* played a motivational role, as one interviewee illustrates: *"Besides the practicalities that you can discuss with each other, the community creates an environment in which everyone is running, trying to create something from scratch. That inspires. The company across the hall just got another round of investments. Your neighbor is working on his first round as well. Everybody is in pursuit of their own dream. It stimulates me to start running as well."* The theoretical framework discussed that *ambition* can be seen as an important form of *human capital*. This example shows how the *internal network* enables the entrepreneurs to develop this particular resource by inspiring entrepreneurs to work harder and set more ambitious targets.

The incubator's *external network* was highly valued when it gave entrepreneurs access to *business knowledge* through a network of specialized consultants (identified by 11 of 15 entrepreneurs): *"What's also nice is access to the professional network of the incubator. For example, we had an event a couple of weeks ago where a professional tax attorney held a workshop about the new legislation and the impact thereof on high-tech firms. ... They have all kind of things: legal, IP, financing, tax, etc. It's nice, especially if you don't have these people in your own network."*

In summary, the middle column reveals that it is important for incubated entrepreneurs to access *human capital* in the form of *business knowledge*, which is provided either directly through coaching or indirectly through the incubator's *social capital*.

4.1.2 Incubator Perspective

The experienced resource constraints of entrepreneurs were in line with the entrepreneurs' constraints as perceived by the incubator as the right column of Table 2 shows a strong focus toward *human capital* as well. The identification of *business knowledge* by entrepreneurs as a critical resource is reflected in the *business knowledge* resource constraint identified by the incubator. Given their technological background, it is no surprise that the

knowledge base of the entrepreneurs was unevenly distributed as they lacked the skills and expertise required for exploring the market and business development: “*There has to be a strong market focus. A lot of ideas we get, people think only from the product itself, like a researcher or so who hasn’t thought of customers at all.*” As a result, the entrepreneurs risked that their companies got separated too far from the market (i.e., that they will struggle to find customers): “*I think that entrepreneurs in general - and starting entrepreneurs in particular- do not pay enough attention to sales. ... Selling their product, really making clear ‘this is what I do,’ that’s a thing that a lot of entrepreneurs struggle with. How are you going to make money?*” This finding is further supported by prior studies which show that technological entrepreneurs often lack the business experience that is necessary for the start-up to become successful (e.g., Chan and Lau, 2005; Vohora et al., 2005).

The finding that entrepreneurs point at the incubator’s *internal network* as an important means to develop and increase their level of *ambition* is reflected in the incubators identifying a lack of *ambition* as the second major *human capital* constraint. Incubator management and staff described how entrepreneurs lack a certain “drive” or ambition to pursue high growth: “*It’s all about the entrepreneurial drive. What is your goal? Where do you want to go? A lot of entrepreneurs are happy when they have one or two customers. There is no bigger plan behind it. ... To really go for it, set ambitious goals. People are happy with what they got. They’re playing it safe.*” Another incubator manager supported this point: “*Most importantly, I think that a lot of entrepreneurs achieve their first successes quite quickly. They have a good initial idea, allowing them to focus on that single idea, further refining it. They attracted some subsidies, maybe even have a first customer. And a lot of entrepreneurs never make it out of that phase. Rather than taking the leap of faith, trying to attract senior management that will enable their company to really grow, but that means to give up a part of their company. They don’t take that step.*” These results are in line with the Global Entrepreneurship and Development Index, which shows that EU countries are outperformed by other developed countries such as the U.S., Israel, or Singapore on the “entrepreneurial aspirations” variable (Acs and Szerb, 2012). The last quote provides an explanation of the lack of ambition; rather than aiming for high growth, which often means to give up part of the company to an investor or senior management, the data suggest that technological entrepreneurs were mainly motivated by a strong desire to be their own boss. This final point is supported by Roberts (1989), who concluded that high-tech entrepreneurs are mainly driven by a strong desire to become independent and be their own boss.

As Table 2 shows, resources other than *human capital* were identified by the incubator to be constraints as well. It seems that these constraints are strongly influenced by the historical context of the incubator. For example, one incubator manager explained that the incubator was originally established to create offices and laboratory rooms for high-tech spin-offs as affordable laboratory space in the region was (and still is) very scarce. For this particular incubator and its tenant firms, *physical capital* was an important constraint. Another incubator manager hinted at *financial capital* constraints, which were present as the venture capital market was underdeveloped due to a small domestic market. However, these constraints were only identified at one incubator, whereas the *human*

capital constraints were identified at all six incubators. More importantly, the *human capital* constraint is not caused by contextual factors but is the result of the general technological background of the entrepreneurs.

4.1.3 Integration of Perspectives

We can conclude from Table 2 that the expected resource constraints of entrepreneurs initially differ strongly from the resource constraints as perceived by the incubator, with the entrepreneurs pointing at tangible resources (such as *physical* and *financial capital*), whereas the incubator identifies intangible resources (*human capital* in the form of *ambition* and *knowledge*) as the most important resource constraints. However, when entrepreneurs spend time in the incubator, their most important experienced resource constraints align with the perception of the incubator, with the entrepreneurs pointing at the importance of accessing *business knowledge* and, to a lesser extent, *ambition*.

The difference between the entrepreneurs' expected and experienced resource constraints is striking. It implies either that the resource constraints of entrepreneurs change over time or that entrepreneurs are initially not aware of *human capital* (in the form of *knowledge*) being important to their success. Closer inspection of the data supports the second explanation by identifying three "barriers" to recognizing this resource's importance and developing it. First of all, one incubator manager described that many starting entrepreneurs are "*unconsciously incompetent*," meaning that individuals do not know how to do something but not necessarily recognize that they lack the knowledge and may deny the usefulness of the skill (Howell, 1982). Given their background, technological entrepreneurs tend to prioritize technological development of their product or service over business development. Not only do they not possess the skills required for business development, they also do not realize that they lack the necessary skills and may not be convinced that executing these activities is indeed necessary for the success of their business. This point was supported by 11 interviewees (both entrepreneurs and incubators). One entrepreneur illustrated this point: "*When you're a first-time entrepreneur, often, you lack the knowledge of the entrepreneur and the ecosystem. But you don't realize it.*" The second point (mentioned by nine interviewees) is that entrepreneurs are hesitant to develop these resources as they lie outside their zone of comfort; given their engineering background, technological entrepreneurs are insecure about activities outside their comfort zone (i.e., business development) or simply do not like them, as was illustrated by an incubator employee: "*They go into their comfort zone. And their comfort zone is the product or service they are developing. And being vulnerable, exploring the marketing side, they often do not like this. It is safer to answer an e-mail of an existing customer.*" Finally, the chaotic day-to-day business of early-stage ventures presents another barrier to developing these resources; this was mentioned by 13 interviewees. Activities such as writing a business plan and exploring markets and business development usually have a longer-term orientation and can, therefore, be easily neglected, as was illustrated by an incubator manager: "*During the daily business, entrepreneurs often forget to thoroughly think about their business plan. Because they turn on their computer, and they got an e-mail from a new customer, or they have to make small adjustments on their website, etc. But they're not doing what's most important—working on their*

business model or their plan on how to enter the market. When will they be able to show the first results? Do they have sufficient liquidity?"

Combined, these three factors create significant barriers for entrepreneurs to recognize the importance of *business knowledge* and to develop or acquire this particular resource, even though both incubators and entrepreneurs (eventually) acknowledge the importance of this resource.

The data suggest that these barriers become less severe over time. As entrepreneurs develop *business knowledge*, they become more aware of the importance of this resource and their own (in)competencies in acquiring and developing it. For example, an incubator manager illustrated how experienced entrepreneurs suffered less from the aforementioned limitations: *"We see that entrepreneurs with more working experience or who already started their own business before are the ones that make the most use of our services. And those that are completely new to entrepreneurship are the ones that sit in their offices with the door closed, and we need to stimulate them to participate in the program. They don't see the opportunities that we offer to them."* The decrease in the unconscious incompetence barrier was illustrated by an entrepreneur as well, when he discussed the importance of activities related to business development: *"You have to be aware of the importance of these activities. But it takes time to get there. ... At first, you don't understand it. ... Later, you start realizing that it's important."* The observation that entrepreneurs identify *business knowledge* as the most important form of support provided by the incubator shows that, eventually, entrepreneurs are indeed able to recognize the importance of this resource.

4.2 Incubator Assertiveness

Next, the incubators that were part of this study were analyzed using dimensions derived in the theoretical framework. Table 3 on the next page shows the 10 incubation programs in terms of assertiveness, the resources they provide, and the maturity of the supported tenants. Table 3 enables us to distinguish between two types of incubators: incubators with a strong intervention approach and incubators with a laissez-faire strategy.

4.2.1 Strong Intervention Incubators

Table 3 shows that a strong intervention approach is dominant for incubators that support relatively young tenants (incubators 1a, 2a, 3, 4a, and 6a). As starting entrepreneurs do not prioritize developing crucial *business knowledge*, early-stage incubators were found to take a highly assertive and proactive approach to guide entrepreneurs through the entrepreneurial process. Incubators had various "intervention mechanisms" at their disposal.

	1a	1b	2a	2b	3
Development Phases	Preorganization	Reorientation	Preorganization	Preorganization to Reorientation	Opp. Framing and Preorg.
Assertiveness	Strong Intervention	Laissez-faire	Strong Intervention	Laissez-faire	Strong Intervention
Resources Provided	All	All (to a lesser extent)	All	All	Financial Cap. Human Cap. Social Cap.
	4a	4b	5	6a	6b
Development Phases	Preorganization	Reorientation	All	Opp. Framing to Sust. Returns	Reorientation
Assertiveness	Strong Intervention	Laissez-faire	Laissez-faire	Strong Intervention	Laissez-faire
Resources	All	All (to a lesser extent)	All (indirect)	Financial Cap. Human Cap.	All (to a lesser extent)

Table 3. Incubator assertiveness

Note: Six incubators were studied, with incubators 1, 2, 4, and 6 distinguishing different phases in the incubation process. This resulted in a total of 10 incubation programs.

First of all, some incubators made participation in workshops and master classes mandatory for companies that wanted to enter the incubator, which means that the incubator decided which resources the tenants develop: *“We require our entrepreneurs to participate in the master class program if they want to enter the incubator. If they are not willing to, then we know that the entrepreneur does not know himself well enough because we know that everyone needs it.”* This forced entrepreneurs to think about long-term strategic issues during the day-to-day business. One entrepreneur illustrated why this was difficult but very useful as well: *“As an entrepreneur, you’re putting in so much hours and effort every day to work on your business. So it’s pretty tough when you’re forced to leave your office for two or three days every six weeks. No phone, no e-mail ... but it’s very useful to take a step back once in a while, to take a strategic overview of your company. Am I still doing the right things? It forces you to think about stuff that is important but not yet urgent.”* The second intervention mechanism was the competition between start-ups—for example, when a group of start-ups competed for a preseed fund: *“It’s really pressing. You have to hurry. You have to realize that what you said that you will do. If you don’t, you know you’ll never get to the next round. And as it is a competition, you know that the others will do their best as well. So it’s always challenging. We were competing with other great start-ups. So I was afraid.”* This element of competition also compensated for a lack of *ambition* or sense of urgency that was described in section 4.1: *“You have, between stage 1 and stage 2, three months. It’s not you come back when you’re ready. You come back in three months. What we look at is the ability of the entrepreneur to behave as an entrepreneur. That’s the sense of urgency.”* The third intervention mechanism was a very assertive incubator manager or coach, which some entrepreneurs even described as

aggressive: *“The coaching sessions were very tough. We presented our ideas, and the coaches were just asking good questions. How will you make revenue? Who’s going to buy it? Why? What is the competition? A lot of questions that we couldn’t answer because we approached our business in an academic way. We have an idea, the customer will be there. So it was very tough feedback.”* Another entrepreneur further illustrated this strategy: *“Our coach made us rewrite our executive summary fifteen times. And every time, he said, ‘What you’ve done is completely ****... The funny thing is, we actually don’t need an executive summary yet. But through this exercise, we are forced to say what really matters in our company. We are trying not to lose ourselves too much in technical detail.”*

The incubator thereby actively guides the entrepreneur through the venture creation process, as an entrepreneur illustrated: *“I think it’s good for first-time entrepreneurs to be confronted, for them to face reality. You want to raise millions? It doesn’t work like that. And it’s good to have somebody to tell that and who can tell you, if you want to organize meetings with venture capitalists and business angels, ‘No, you’re not ready.’ We don’t like that as first-time entrepreneurs. We don’t like anybody to tell us what to do. But I think it’s useful.”*

Another interesting observation was that the incubators provided strong incentives for tenants to participate in the program: high amounts of price money as *financial capital*, *physical capital* in the form of free office space, or *credibility* when entrepreneurs received a venture award as they beat their competitors. These incentives can be regarded as a reward for entrepreneurs to follow the incubator’s advice and guidance.

4.2.2 Laissez-Faire incubators

A laissez-faire intervention approach was dominant for incubators supporting tenants at a later stage (1b, 2b, 4b, 6b). Mature tenants had a stronger resource base and were aware of the importance of business knowledge.

Tenant firms were given access to a similar range of resources as in the strong intervention strategy, but the incubator took a demand-driven and facilitating role. This means that the incubator provided entrepreneurs with access to the resources they needed, but it was up to the entrepreneur to take the initiative: *“There is a good understanding between our company and the incubator. When we run into a certain problem, we let them know, and they help us where they can.”* Another entrepreneur illustrated this point: *“When I need help on a specific issue or I run into trouble, then I know that I can approach them. If I feel the need to.”*

Laissez-faire incubators were found to be less intense not only in terms of assertiveness of the incubator, but also regarding the flow of resources; although the incubators provided tenants with a similar comprehensive range of resources, tenants relied less on the incubator’s resources as they had developed a strong resource base for themselves already. One incubator manager illustrated this process: *“The first phase is more intense, for example, with the master class program in which all the entrepreneurs participate. As entrepreneurs and their companies mature, they start building their own network, and we also expect them to have their own advisory board after four of five years. So they become less dependent on our coaches.”* Another incubator manager confirmed this: *“With our model, the need for what I call the ad hoc business support is less than before. Because those inexperienced companies, they come knock on your door every day.”*

Many entrepreneurs experienced the freedom as a good thing: *“I think that an incubator should not get too involved with the companies. It’s not a kindergarten. As an entrepreneur, you’re running your company, and you should take responsibility for your own actions. An incubator should offer the opportunities to participate in workshops, open up their network, etc., but they shouldn’t spoil the entrepreneurs.”* However, this laissez-faire policy showed its limitations when entrepreneurs demonstrated that they are not yet aware of the importance of business knowledge. One incubator manager illustrated this in an example where entrepreneurs suffered from unconscious incompetence and a high workload: *“Sometimes I just know that participating in a particular workshop would be extremely beneficial to some entrepreneurs. But they are not willing to go to the workshops we organize because they feel too busy, and they do not see that these things could really help their business. But we can’t force them.”*

5 Conclusion

This study aimed to contribute to existing incubator and entrepreneurship literature by identifying the most important resource constraints of incubated entrepreneurs and the resource transfer processes through which constraints are solved.

It was found that the resources that entrepreneurs look for when joining the incubator differ strongly from the resources that entrepreneurs eventually find most valuable and the resources that incubators perceive as most constraining to entrepreneurs. We found that at the early stages of start-ups, the expected constraints of entrepreneurs focus on tangible resources (i.e., *physical* and *financial capital*), whereas the perceived constraints of incubators relate to intangible resources (*human capital* in the form of *business knowledge* and *ambition*). Later, the perspective of the incubator and entrepreneurs align, with entrepreneurs referring to the same intangible resources as their most important experienced constraints. The initial inability of entrepreneurs to recognize *business knowledge* as a constraint and develop this particular resource can be explained by the fact that incubated entrepreneurs are (1) unconsciously incompetent about the importance of this resource, (2) hesitant to step out of their comfort zone in order to acquire this knowledge, and (3) primarily short-term oriented. Our findings also suggested that these three “barriers” decrease over time and that entrepreneurs eventually recognize the importance of acquiring and developing *business knowledge*.

The dynamic nature of the concepts identified in section 4.1 helps to understand *why* incubators pursue different processes. When tenants are young and do not prioritize developing *business knowledge*, incubators were found to be highly proactive in order to ensure that tenants focused on developing the right set of resources. Later, when entrepreneurs recognized the importance of *business knowledge*, the incubator takes a more demand-driven approach to ensure an optimal fit for start-ups in every stage of the venture creation process. Furthermore, we found that later-stage tenants relied less on the incubator’s resources as they had developed a strong resource base themselves, which is in line with previous literature (McAdam and McAdam, 2008).

5.1 Limitations

This study has some limitations that need to be taken into account when interpreting the results.

First of all, the fact that interviews with incubators and entrepreneurs were only conducted at one point in time presents a limitation to our data. The substantial differences between entrepreneurs’ initial (expected) constraints and their experienced resource constraints asks for further longitudinal data to better understand how entrepreneurs’ resource constraints change over time. We, therefore, support earlier made calls for more longitudinal research designs to be applied in the field of high-tech entrepreneurship and incubation (Costa-David et al., 2002; Rothaermel et al., 2007)

Secondly, with six European Climate-KIC incubators, the sample of this study was limited. It would therefore be interesting to conduct a similar study in different environments, such as some of the high-tech regions in the U.S.

The incubator's focus on high-tech sectors and entrepreneurs is the third limitation of this study. The resource constraints of the entrepreneurs in this study were found to be strongly influenced by their background as their technological, educational, or work experience affected their ambitions and resulted in a lack of *business knowledge*.

The focus of this study on incubators affiliated with universities (which were mostly institutes of technology) is therefore another important limitation, and it would be interesting for further research to study resource constraints of incubated entrepreneurs with entrepreneurial experience, with a business or management background, and/or without a university affiliation.

Finally, this study did not take the success of incubators into consideration. The question of how to measure incubator success is one of the most controversial and complex debates in incubator research (Hackett and Dilts, 2004; Dee et al., 2011) and was therefore outside the scope of this study. At the same time, our observation that incubators perceive tenants to have a lack of ambition suggests that incubators and tenants have a different definition of success (incubators strive for high growth, whereas entrepreneurs are mainly driven by a desire to become their own boss). Another suggestion for further research is therefore to explore these differences as well as the question of whether different processes have different levels of success.

5.2 Theoretical Implications

We extended incubator literature by developing two important insights. First of all, we showed that incubators and entrepreneurs do not necessarily perceive similar resource constraints. Second, we identified three barriers that explain why entrepreneurs may be unable to recognize the importance of *business knowledge* and used these concepts to explain why incubators use different processes.

Our results provide mixed implications for the incubator-university relationship. On the one hand, our results suggest that universities can only play a limited role in the incubation process as they do not possess the *business knowledge* and commercial *ambition* that form the most important constraints of entrepreneurs. On the other hand, we showed that entrepreneurs are certainly not constrained by a lack of *technological knowledge*, which could be regarded as the merit of the university. Further research is necessary to provide deeper insights into this debate and, therefore, into the added value of *university-affiliated* incubators. Based on our data, we conclude that the most important function of the university is to supply the incubator with entrepreneurs that possess *technological knowledge*.

This study also contributes to our understanding of the RBV in the field of incubator research by showing some of its limitations. This study showed the importance of the processes through which resources are acquired and developed. We also showed that entrepreneurs do not necessarily recognize the resources that are crucial to the success of their businesses. This implies that resources alone are insufficient to fully understand the incubation process. Our study, therefore, suggests that scholars who want to apply the RBV to incubator research in the future should be careful not to neglect these processes as well as the influence of unconscious incompetence.

5.3 Practical Implications

The results of our study suggest that there is no such thing as a “one size fits all” incubation strategy. Effective incubators must find a way to adapt their processes to facilitate entrepreneurs in the different stages of maturity. We, therefore, suggest that incubators use a combination of multiple processes to ensure an optimal fit with tenants. For incubators to be most effective in providing tenants with a competitive advantage, they should give tenants access to resources that are valuable and scarce. We argue that this mainly holds for the intangible *human capital* resources of the incubator (either accessed directly through coaching or training or indirectly through the incubator’s *social capital*). However, when entrepreneurs enter the incubator, they will request for *physical* and *financial capital*, which can be provided by other actors in the entrepreneurial ecosystem as well and is therefore less valuable as a resource. In later phases, when tenants have developed a solid resource base but are not yet able to be completely independent, incubators can adopt a demand-driven strategy and let the entrepreneur take the initiative in the incubation process.

Finally, our study has some important implications for entrepreneurs as well. First of all, entrepreneurs should focus on intangible resources next to tangible resources since the former are seen as key to successful entrepreneurship by more experienced tenants. Intangible resources can aid in overcoming unconscious incompetencies. Finally, entrepreneurs may use our distinction between assertive and demand-driven intervention processes to find an incubator that suits their particular needs and maturity.

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