Chapter 11
University Incubators May Be Socially Valuable, but How Effective Are They? A Case Study on Business Incubators at Universities

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Abstract To counter the high failure rate of small entrepreneurial start-up companies, many universities set up business incubators that nurture start-ups until they are prepared to stand on their own. There are many different types of incubator, and while the evidence of their success is inconsistent, some research suggests that they do succeed in one of their primary goals because start-ups that begin in incubators have a higher survival rate (c.f. J Technol Transf 48(5):692–710, 2004) compared to non-incubator companies.

Traditional definitions of incubators (J Technol Transf 29(1):55–82, 2004) generally include: (a) Shared office space rented at favourable rates, (b) Shared support services that reduce overhead costs, (c) Professional business support, advice and mentoring, and (d) Professional and trade networking. While each of these aspects has been studied by academics, the general consensus is that the most important factor for start-up success is the final factor—organized networking (Int J Entrepreneur Innovat Manage 4(2–3):248–270, 2004). Recent work has shifted the focus of research on the role played by incubators as a mechanism for embedding a company within networks, recognizing that much of the entrepreneurial literature stresses that access to networks plays a crucial role for start-ups and small companies.

In recent years, the business world has seen major changes in the way that organizations manage their network interactions and interactions with customers. One of the main factors in this change is new technology and data transmission capabilities. However little research has yet looked at networking and cooperation activities within incubators or how entrepreneurs use these technology-enabled networks to support development and growth.

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The aim of this chapter is to examine non-profit university-based incubators focusing on their role in business networking and cooperative activities. The study is exploratory and focuses on incubators at two large public universities in Spain and the UK. The main contribution of this chapter is to confirm that effectiveness assessment of incubators is so far un-systematic. This is dangerous because the lack of rigorous assessment tools and methodologies feeds the uncertainty surrounding business incubator effectiveness and ultimately threatens their ability to make meaningful contributions to the success of the companies they nurture.

Keywords Business incubators • Entrepreneurs • Entrepreneurship • Incubators • International Business Incubation Association • Key incubator performance statistics • Networking • Spain • Spin-off • Start-up • United Kingdom • University • University entrepreneurship support

11.1 Background—Why Incubate?

The International Business Incubation Association (NBIA), the world's largest association of business incubators, says "Business incubators nurture the development of entrepreneurial companies, helping them survive and grow during the start-up period, when they are most vulnerable. These programs provide their client companies with business support services and resources tailored to young firms. The most common goals of incubation programs are creating jobs in a community, enhancing a community's entrepreneurial climate, retaining businesses in a community, building or accelerating growth in a local industry, and diversifying local economies." (NBIA, corporate mission statement, 2016).

Business incubators attract public money because they are seen to have the potential to create jobs, revitalize economies or regions, diversify or modernize local economies, commercialize new technology, e.g. based on university research or the private sector. Given the diversity of goals, there are also many different types of business incubator, but the largest groups are the public non-profit-oriented incubators, and university incubators. As of 2012, there were about 7000 incubators worldwide, and 850 in Western Europe (NBIA, FAQs, 2016).

Yet despite their popularity, the evidence for business incubator effectiveness is mixed and some researchers such as Tavoletti (2013) call for more theoretically sound and methodologically robust means of assessing incubator results. Tavoletti questions the continued investment of public money in business incubators, arguing that there must be some doubt that they meaningfully meet their goals of supporting innovation, entrepreneurship or regional development and therefore do not satisfy public policy objectives (Tamàsy, 2007). While there is an abundance of literature about incubators, much of it claiming to evaluate effectiveness, most of it is only very loosely quantified, and much is methodologically questionable, with very few attempts to compare the measured effects against unintended ones, and few attempts

at replicating effectiveness studies across time or place. For example, an analysis of the Israeli Technology Incubator Program (TIP) (Roper, 1999) points to some individual successes but concludes there is little firm proof that it adds value or is cost-effective. A later study of 43 Italian new technology firms showed that input and output measures of innovative activities are only marginally different between incubated and non-incubated firms (Colombo & Delmastro, 2002). On the other hand, some studies have found higher survival and success rates among the graduates of business incubators (Allen, 1985; Campbell, 1989).

In this paper, incubators are conceptualized as an evolving innovative organizational form of vehicle for enterprise development. This study is confined to European incubators and recognizes that the role of the incubator in the entrepreneurial process has evolved from being an affordable business centre with office facilities to one offering support, training, and networking to start-up firms. Although past studies have looked at different incubator types, including for-profit, and not-for-profit, this study is concerned only with not-for-profit incubators based at universities. This type typically prioritizes encouraging entrepreneurial activity amongst students and also to involve an enterprise component for university staff, that is sometimes focused on research-derived commercialization projects.

11.2 Research Question

Given the unresolved empirical evidence of incubator effectiveness, and the fact that they remain popular at universities, especially those with a new technology focus, this paper aims to make a contribution in the form of new insights on the evaluation of effective business incubator functions. It also aims to identify further avenues for research to address issues of effectiveness evaluation.

11.2.1 Method

This research begins by identifying the main issues in university-based incubators. This is accomplished through a literature review that builds on an extensive previous review by Tavoletti (2013) who was concerned with establishing a theoretical framework for evaluating business incubator effectiveness. He also laid out four main guidelines from a theoretical perspective about the primary principles under which incubators should operate. Briefly, the main functions of incubators should be to:

1. Protect weak-but-promising ventures from the market and do not emulate the market in the incubator.
2. Take the region fully into account: when deciding about establishing the incubator, when selecting ventures, when providing business support to the selected ventures.

3. Consider business incubation as a process, option-driven, relational and network-based, not as a tangible investment.
4. Take advantage of new technologies and a 'virtual incubation' approach to bring public supported business incubation into regions that cannot support a business incubator.

Taking these principles further, the main focus in this research is on the role of networking. We explore this with in depth interviews with managers of two university business incubators, specifically addressing the nature of their networking activities, and tying those to evaluations of incubator success. The interviews are to be seen as exploratory and confirmatory of the current state of affairs for most incubators. With this, it is possible to lay out avenues for future research.

11.3 Conceptual Framework

From a resource-based perspective of the firm, one of the main challenges to start-ups is to create or access the best (most valuable) resources and build barriers to their mobility and inimitability (Barney, 1991). If an incubator offers such resources, each tenant gains by having access to the most valuable resources in their industries. The implied question here, however, is that if each firm has access to the most valuable resources, how does an individual firm differentiate itself from its competitors?

In contrast, social network theory suggests that start-ups draw upon networks (social and professional) and construct new ones to obtain knowledge and resources for their firm (Aldrich, 1999). In this scenario, incubators may fill in for an entrepreneur's lack of networks. Burt (1992) argued that when it comes to information access, the strength of ties within a network is less important than the number of non-redundant ties. This implies that a varied, broad based, loosely connected network is of great importance to entrepreneurs. In social network terms, brokers are actors who facilitate links between persons who are not directly connected. In this sense it is also possible to view incubators as brokers, with emphasis on the role of incubators as an intermediary to a much larger set of networks.

In sum, it is possible to view the entire incubation process as one that fosters community, or the theory of "community of practice," (Wenger, 1998). In this way of thinking, the interaction among the tenants and owners of an incubator may help in shaping the learning of each entity in that group due to a shared sense of understanding of overall community objectives.

11.3.1 The Functions of Incubators

Incubators serve a variety of purposes, but these days are often developed to serve technology-based firms. By providing a variety of services and support to start-ups the incubator seeks to effectively link talent, technology, capital and know-how to

accelerate the commercialization of technology (Smilor, 1987). This is based on the idea that over 90 % of the new business start-ups fail within the first 5 years, often because of lack of management skills and/or capital. New ventures typically lack many of the necessary resources required for success. In addition all the elements or resources that will be needed cannot be known at the outset but are revealed as the venture evolves. Therefore incubators can directly provide some of the resources as well as indirectly provide access to resources via formal and informal networking to sources beyond the incubator.

Higher education institutions provide fertile environments for entrepreneurship and many universities have developed incubators with programmes to help educate future entrepreneurs and to help them to take their first steps to start up a business. This has also been a learning process for universities that have found that they too need to be entrepreneurial in order to promote entrepreneurship. Many are therefore developing new linkages between education, research, and business communities to foster social and economic development, and also to expand the broader impact of their core activities in education and research.

At the core of these activities is the recognition that by surrounding students with proper and meaningful support, many of them can flourish in the modern economy. Higher-level policy makers also recognize this: “University graduates have enormous potential for innovation and economic development. Mobilising them for entrepreneurial careers, enhancing their entrepreneurial skills, and providing support for business start-up are important, and often new, tasks for higher education institutions that are only now being fully recognised. In OECD countries public policy has an important role in stimulating innovative and good practice approaches by universities and supporting the exchange of lessons learned” (OECD, 2009).

University entrepreneurship support, considered on its own, has its limits. It prepares students for future entrepreneurial careers and promotes the commercialisation of research results. However, success depends upon the close co-operation and integration of the university internal support with the external entrepreneurship support system.

Assisting the establishment of new firms is a key objective of university entrepreneurship support, but not its only one. The co-existence of tangible outputs (e.g. the number of assisted new ventures) and intangible outcomes, such as the spread of entrepreneurial culture and the creation of entrepreneurial mind-sets, renders assessing the impact of university entrepreneurship support a challenge that requires tailored approaches and systematic, long-term evaluation efforts.

Entrepreneurship education can play at least three legitimate roles in the development of an entrepreneurial society. First, it can present entrepreneurship to students as a possible career choice as well as acting as a general advocate for the mind-set and type of creativity employed in entrepreneurial endeavours. Second, it can assist students in developing the technical and business skill-set essential to having a successful entrepreneurial career. Third, professional educators can assume the responsibility of advancing the body of knowledge associated with the entrepreneurial phenomenon. Their findings should not only be disseminated to students but also to policy-makers and the public at large (Redford, 2006).

11.3.2 Fostering Entrepreneurship in Universities

At the most basic level, education and training can lay out for potential entrepreneurs frameworks for thinking about how to start a business. There are many structured ways of thinking through business issues—e.g. commercial banks can provide a business start-up guide that asks important questions such as: What will the business do? Who are the customers? What will they pay? and so on. When focusing on the entrepreneur, another simple structural framework involves a budding start-up being clear about three things: (a) who they are, (b) what they know, and (c) whom they know. They should also be aware of their own traits, tastes, and abilities, their intellectual capital, and the social networks they are a part of. And because start-ups have limited means (which is why incubators are important) they are less likely to use traditional market research, formal business plans, or comprehensive contracts, and are more likely to use "seat-of-the-pants marketing" and selling alliances. They are also more likely to take a short-term view, and eschew formal hierarchical structures for participatory cultures based on the start-up's relational capital.

It is the final point on relational capital that is of most interest. This is because while university incubators have traditionally emphasized their roles in providing shared office space at favourable rates, shared support services, professional business support, advice and mentoring, and professional and trade networking, the consensus is growing that the most important factor for start-up success is organized networking (Haapasalo & Ekholm, 2004).

11.3.3 Networks and Networking

Networks play a critical role in many aspects of entrepreneurial activity. Research suggests that they can enhance entrepreneurs' responses to changes in technologies and the competitive environment (Volberda, 1996). Networks have also been found to ease the transfer of complex knowledge, e.g. technology knowledge, in such a way that is understandable to the entrepreneur (Cohen & Levinthal, 1990; Reagans & McEvily, 2003). In addition, since technology changes rapidly, entrepreneurs must continually keep up with the changes that affect their product/service. Because of the challenges associated with managing change, network reliance for technology knowledge is likely to be particularly important when it comes to developing innovations. Networks should also be especially effective in helping entrepreneurs keep up with the changing technologies that will impact the development of their firm's offerings.

While entrepreneurs are in the process of developing their business model, market knowledge is critical to shaping an offering that fits with the market's needs. As with technology, change in markets is continuous and since new ventures are unknown in the market, they face the additional challenge of attracting new customers and generating sales (Freeman, Carroll, & Hannan, 1983). Fortunately, the

acquisition of market knowledge through networking may ameliorate these challenges (Danneels, 2002; Hoskisson & Busenitz, 2002; Wiklund & Shepherd, 2003).

Networks can be especially useful during early stages of venture development, where market knowledge is likely to be equivocal and customer preferences are unclear or evolving and the entrepreneur needs up-to-date marketing intelligence for successful commercialization. By sourcing knowledge from customers and/or other external resource providers like suppliers and manufacturers, the entrepreneur is able to develop a more accurate understanding of how customers can effectively be reached. Further, because markets are dynamic, entrepreneurs who rely more on external sources, like networks, for market knowledge may be better equipped to understand and act on the knowledge acquired. This is because networks can help communicate market knowledge in such a way that is logical and useful to the entrepreneur, which is essential to achieving outcomes, like sales. Moreover, in conditions of rapid environmental change, the ability of entrepreneurs to accurately assess market intelligence may be undermined by a lack of time to make decisions. Networks that supply market knowledge can also provide the entrepreneur with multiple evaluations of such knowledge, thereby improving the match between market needs and the supply of technology (Liebeskind, Oliver, Zucker, & Brewer, 1996). In essence, networks allow for rapid access to knowledge, more accurate knowledge regarding market preferences, and a higher likelihood of finding novel ways that market needs may be met.

11.3.4 Networks and Universities

Given that many universities view themselves as a nexus that connects entrepreneurs, research and relevant knowledge bases, it is not surprising that they have developed business incubators to exploit networking opportunities. Indeed, business schools especially see the encouragement of start-ups and entrepreneurial activity as not just a priority, but as an opportunity to put research and theory to real-world test.

David J. Miller, a researcher at George Mason University's School of Public Policy discusses entrepreneurial ecosystems, saying, "The culture on campus is definitely changing, to be a real player as a university today. You have to engage students and faculty who are increasingly interested in starting companies." Students and researchers often choose to establish their own businesses outside the university environment (Stagars, 2014), but in recent years interest in entrepreneurship has surged, both inside and outside universities. Entrepreneurs are increasingly realizing that the higher education environment has much to offer, and students are beginning to launch projects while doing their degrees (Stagars, 2014). Facebook and Snapchat were both started within universities, and provide inspiration to current students.

On the other hand, Frank Rimalovski, Managing Director of the NYU Innovation Venture Fund, notes that *The University has always been a supplier of both technol-*

ogy and talent, and it's our job to foster and support that. There's definitely been a groundswell of entrepreneurial interest from students and if there's another Zuckerberg (Founder of Facebook) walking around our hallways, we want to be as supportive as we would of a faculty member working on a new cancer therapy.

This chapter deals with how universities are transforming their organization to deliver the key components that college entrepreneurs need to succeed. How do the universities deal with start-ups and how do they organize resources so that they are effectively employed to encourage entrepreneurship? What are the main obstacles that universities face in creating effective programs to support university entrepreneurs?

As Manuel Stagars explains in "University Start-ups and Spin-Offs," (2014), "The use of the university's assets in the marketplace is not their strength, and unfortunately, the impact of scientific research on the lives of people outside of academia is small. This is unnecessary, because universities occupy an important space at the intersection between science, business, and public policy." With proper design and strategy, universities could set up robust ecosystems for start-ups to the advantage of students and researchers. In short, a university with a strong entrepreneurial ecosystem is the ideal launch pad for start-ups. Most universities have all the components to build one right in their backyard. They just need to remove the blockages that prevent the ecosystem from growing (Stagars, 2014).

11.3.5 Enabling Transformation

As new technologies make businesses, including the business of education more global, it is essential for the university to adapt to modern business thinking in ways that help them to manage their core business of education and research and also to move into new fields such as the promotion of entrepreneurship. Such change requires a shift of mind-set. In fact many staff in universities could learn a lot about risk taking and opportunity tackling from entrepreneurs. Thus, in order to be better at encouraging entrepreneurial activity, universities may well need to train themselves and develop incentives to implement entrepreneurial processes of all sorts.

Efforts in this area could logically focus on:

1. Motivation and freedom: Universities must convey to students the motivation to start new entrepreneurial projects and be supported to carry them out (Stagars, 2014).
2. An ecosystem: universities should eliminate obstacles and barriers that hinder the creation of a university business ecosystem that enables new projects to emerge.
3. The university must itself be a network, one that allows students, teachers and researchers to establish ties and launch projects (Stagars, 2014).
4. Entrepreneurial activity should extend to the classroom, as an ethos for business activity itself (Knoop, 2006). Universities and their business incubators should also adopt transformative business philosophies focused on evolving their business models in line with real-world practices.

5. Creating an atmosphere of entrepreneurship at University: In general, most university staff and teachers have never launched their own company, so at best, they have only theoretical knowledge of entrepreneurship. This is where mentoring in business incubators at universities adds value (Zack, 2015).
6. The feedback loop should extend to the development of meaningful metrics that can enable the rigorous assessment of the effectiveness of all aspects of incubator operations.

11.3.6 Performance Assessment

Some efforts at benchmarking for performance assessment have been made by the OECD (2002), summarized in the Table 11.1 below. This provides a key set of averages, ranges and benchmarks that can be quantified. The values are based on an analysis of survey data and discussions with incubator managers on best practice

Table 11.1 Summary of key incubator performance statistics and suggested benchmarks

Setting up and operating	Average	Range	Benchmark
Average capital investment cost	€3.7 million	€1.5 to €22 million	NA
Average operating costs	€480,000 p.a.	€50,000 to €1.8 million	NA
% of revenue from public subsidies	37 %	0–100 %	25 %
Incubator space	3000 m^2	90–41,000 m^2	2000–4000 m^2
Number of incubator tenants	27 firms	1–120 firms	20–30
Incubator functions	*Average*	*Range*	*Benchmark*
Incubator occupancy rates	85 %	9–100 %	85 %
Length of tenancy	35 months	6 months to no max.	3 years
Number of management staff	2.3 managers	1–9 managers	2 managers min.
Ratio of incubator staff:tenants	1:14	1:2–1:64	1:10–1:20
% of managers' time advising clients	39 %	5–80 %	50 %
Evaluating services and impacts	*Average*	*Range*	*Benchmark*
Survival rates of tenant firms	85 %	65–100 %	85 %
Average growth in client turnover	20 % p.a. (2001)	5–100 % p.a.	25 %
Average jobs per tenant company	6.2 jobs per firm	1–120	NA
New graduate jobs per incubator p.a.	41 jobs	7–197	NA
Cost per job (gross)	€4400	€124 to €29,600	€4000 to €8000

standards. It should be stressed that given the diversity of incubator operations and objectives, the benchmarks will not apply universally. Similarly, it is not possible to quantify benchmarks for many aspects of incubator operations (OECD, 2002).

Rothaermel and Thursby (2005) looked at business incubators that were linked to a university over the period 1998–2003. Their results showed a trade-off in that incubated firms with no university ties were 'more likely to fail but also more likely to successfully graduate within a timely manner.' Aernoudt (2004) claimed that the importance of the links between universities and incubators is greatly overestimated: 'good-quality houses, four-star hotels, good restaurants, and proximity to an international airport are much more important than proximity to the university.' He asserts that even the best and most noted university business incubators demonstrate little or no connection to the university. Rather, it is a city/university reputation as a seat of learning that encourages people to start-up nearby, many of which have no connection to the university.

Slightly outside the scope of university incubators is the 'networked incubator', studied by Bøllingtoft and Ulhøi (2005) in their work on social capital. The networked incubator is of interest here because it is a hybrid form that provides preferential access for tenants to a network of companies. The main contribution is to show that such incubators help to correct market failures and the overweening problem of 'newness.' This is a marketing-based view that borrows from the new product literature to address issues related to firm age and lack of visibility in the market and also not being a fully-fledged member of a business 'community.' They show that networking is key to building market-based assets and that nurturing social capital through social networks (in the broad sense) is increasingly important. Singh and Jain (2003) take a similar tack and assert that cluster development and 'facilitation of social network-building activities' are key to incubator success. Their idea of the 'networked incubator' is that incubators will perform better when based solidly in a region, social community and single industry.

11.4 Conclusion and Discussion

In the last decade, there have been changes in the practice of launching and managing business. Advances in computer technology, automation, rapid prototyping, and digitization have made it easier to market the university world projects. Entrepreneurship is a skill that is becoming increasingly important. Students and researchers must learn this ability to compete in a global world. However, despite the great efforts of universities to adapt to the needs of new generations and new technologies, high investment costs and years of design and optimization are barriers to success for incubators.

More importantly, the effort to establish meaningful performance assessment systems for incubators is just beginning. At this point in time it seems incubator managers perceive the incubation process to be one of fulfilling broadly stated policy objectives such as nurturing start-ups, helping to commercialize research and

aiding the transfer of knowledge to society from universities, i.e. focusing on the traditional notions of how business and entrepreneurship work. Universities may want to boost the possibilities of creating new companies, creating a more entrepreneurial culture and helping students and researchers with the know-how to start a start-up. However these goals will remain dreamlike if they do not pay more attention to what works and what doesn't, to what is effective and efficient instead of what is traditional. While business incubation is widely seen as an effective support infrastructure for SME and entrepreneurship in many countries, systematic evaluations are needed to understand whether business incubation is an effective and efficient policy tool in those countries.

In this chapter we have taken an entrepreneur-cantered perspective of the creation of value, and are therefore adding to the growing body of literature that undertakes this view (Aaboen, 2009; Clausen & Korneliussen, 2012; Hughes, Ireland, & Morgan, 2007). Secondly, by exploring the networking processes, 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 & Ingle, 2011; Hackett & Dilts, 2004).

This chapter examined non-profit university-based incubators focusing on their role in business networking and cooperative activities. The main contribution of this chapter is to confirm that effectiveness assessment of incubators is so far unsystematic and sporadic, and much work needs to be done in this area. This is a pressing need because as business incubators and their tenants lay more emphasis on networking, networking technology, and social networking, a more detailed and nuanced knowledge of how these developments affect start-up and incubator performance will be essential. Without better understanding and rigorous assessment tools the effectiveness of university incubators will remain a matter for conjecture, and this could ultimately threaten their ability to make meaningful contributions to the success of the companies they nurture.

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