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# Open accelerators for start-ups success: a case study

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## Abstract

**Purpose** – The purpose of this paper is to investigate how the context of open innovation offered by accelerators can affect the successful growth of start-ups. The authors explore accelerators practices and tools in sustaining start-ups and increasing survival probability in their innovation process, with the aim of addressing the following research question: how can start-ups benefit from participation in an accelerator programme from an open innovation perspective?

**Design/methodology/approach** – A review of the literature on start-up successes and failures and on major practices in the open innovation paradigm was carried out, delineating them in the context of accelerators. Given the absence of literature on accelerator practices for supporting start-ups, and aiming at a comprehensive understanding of how the open environment within the accelerator influences a start-up's survival (or even success) by mitigating the probability of failure, the authors conducted an exploratory case study in an English accelerator.

**Findings** – The open innovation practices mediated by an accelerator and the ones that are not covered, but that can benefit a start-up's survival, are shown. On the one hand, main effective practices, such as dyadic co-creation with accelerator network partners and crowdsourcing, are revealed to address mostly the lack of, or wrong direction in, product, marketing and relative managerial abilities, which are not usually owned by a start-up due to its "newness". On the other hand, some causes of failures, such as the intrinsic characteristics of founder teams, do not seem to be addressed by an open approach and neither does participation in an accelerator programme.

**Originality/value** – This paper is the first to study and link the literature on accelerators, start-ups and open innovation.

**Keywords** Case studies, Open innovation, Business failures, Accelerators, Start-ups

**Paper type** Research paper

## Introduction

Schumpeter (1934) underlines the importance of new firms as key drivers of economic development, industrial evolution and innovation as they are founded to convert innovative ideas into commercial products (Beckman *et al.*, 2012). They renovate the market, facilitate competition and can also contribute to job creation (Birch, 1987).

Despite their potential, many new firms fail in the early stages of their life (Dahl and Reichstein, 2007) and few grow to medium size (Kirchhoff *et al.*, 2013). Different factors have been studied to explain the survival or failure of start-ups (Phillips *et al.*, 1989; Shane, 2001). In particular, the normally small size and the newness of start-ups entail a limited scope for investing in research and development processes (de Jong and Freel, 2010) and a lack of resources for structuring normal operative activities (Dahlander and Gann, 2010; Grimaldi *et al.*, 2013). Weiblen and Chesbrough (2015) argue that "when it comes to agility, start-ups have an edge over large corporations - whereas large corporations sit on resources which start-ups can only dream of".

Openness to external knowledge sources and creation of business relationships for innovation have been recognised as two crucial factors for overcoming such limitations in the early stages of a firm's development (Carlsson and Corvello, 2011; Kask and Linton,



2013; Eftekhari and Bogers, 2015). The open innovation paradigm (Chesbrough, 2003) represents a valuable perspective for firms to open up their innovation process leveraging both internal and external sources of knowledge and widening the potential to realise new business opportunities (Chesbrough and Rosenbloom, 2002). So far, literature has focussed mainly on the engagement of start-ups in the innovation networks of incumbent firms, where larger corporations can leverage the technological base developed by the smaller firm (Shane, 2001; Chesbrough, 2006; Duarte and Sarkar, 2011; Weiblen and Chesbrough, 2015). The aim of this paper is instead to investigate how start-ups can benefit from open innovation adoption to enhance early-stage growth. This is in line with recent calls for further research (e.g. van de Vrande *et al.*, 2009; Lee *et al.*, 2010; Duarte and Sarkar, 2011; Grimaldi *et al.*, 2013) to fully understand how adoption of open innovation practices can play a role in different types of small-medium-size enterprises (SMEs) – e.g. start-ups – and in different phases of company growth.

Moreover, open innovation implies leveraging external knowledge and commercializing opportunities by managing the knowledge flows across corporate boundaries (Chesbrough and Bogers, 2014; West and Bogers, 2014). In this sense, business incubation and venturing mechanisms have received increasing attention in open innovation literature (van de Vrande *et al.*, 2009; Chesbrough and Brunswicker, 2014). Eftekhari and Bogers (2015) and Scillitoe and Chakrabarti (2010) demonstrate that being located in the open environment of a business incubator was one of the main factors affecting a new venture's success in terms of survival, sales and employment growth and new collaborations. In fact, these kinds of organisations were established with the aim of supporting and accelerating the creation of new entrepreneurial companies by offering them access to external partner and resource networks (Pauwels *et al.*, 2015). With their role in boosting new ventures, institutions such as incubators, accelerators and angel ventures are recognised as key players in promoting innovation and economic growth with effects on the overall innovation ecosystem (Isabelle, 2013).

While previous entrepreneurship literature (e.g. Grimaldi and Grandi, 2005; Lendner and Dowling, 2007; McAdam and Marlow, 2007; Schwartz, 2013) is mostly focussed on incubators and their role in enhancing start-up success, research on accelerators is recent and lacks comprehensive data sources (Cohen and Hochberg, 2014) and a consistent theoretical lens to study the phenomenon (Pauwels *et al.*, 2015).

This paper aims to bridge the gaps identified in open innovation (as regards implications for start-ups) and in new ventures (as regards start-ups and accelerators) literature by investigating how the context of open innovation offered by accelerators can affect the successful growth of start-ups participating in accelerator programmes. For this purpose, accelerator practices and tools were explored through “the lens of open innovation” (West *et al.*, 2014) and their implications on the start-up innovation process were evaluated. An exploratory case study conducted in a UK accelerator allows us to answer the following research question:

*RQ1.* How can start-ups benefit from participation in an accelerator programme from an open innovation perspective?

## Theoretical background

### *Start-ups and failure*

Entrepreneurs create value by leveraging innovation to exploit new opportunities, create new product market domains and commercialise new technologies (Drucker, 1985; Miles, 2005). In fact, starting a new business means creating an innovative product or service – and maybe seeking to create a new market – in a context of extreme uncertainty and high-competitive pressure (Ries, 2011; Trimi and Berbegal-Mirabent, 2012). Since

start-ups introduce new products or services that put the position of incumbent firms in doubt, they are often considered as sources of “creative destruction” (Criscuolo *et al.*, 2012) and often as more innovative than established firms (Shane, 2001).

On the other hand, the small size of start-ups (Gruber and Henkel, 2006) implies both limited resources and numerous investment needs, including R&D, organisation building and market development. Normally, they lack market visibility as well as “connectedness” to resource networks due to their “newness” and need support in promoting innovation and entrepreneurship (Wong *et al.*, 2005). Entrepreneurs’ decision making is indeed challenged by a lack of knowledge of how to identify and exploit market opportunities (Alvarez and Barney, 2010) and ability to exploit opportunities for innovation offered by the mechanisms of external knowledge sourcing (Cohen and Levinthal, 1990) and external learning (Almeida *et al.*, 2003).

Start-ups are defined as organisations created to search for a business model that is scalable, as the customer base should be easy to increase, resulting in a gain greater than the expenditure for customer acquisition, repeatable in time and profitable in terms of return on invested money (Blank, 2010; Blank and Dorf, 2012). A business model describes how strategy is concretely implemented (Casadesus-Masanell and Ricart, 2010), and then how a company creates, delivers and captures value (Osterwalder and Pigneur, 2010). Many start-ups often fail before they fulfil their entire business potential (Crowne, 2002; Feinleib, 2011; Ries, 2011; Giardino *et al.*, 2014; CB Insights, 2015). Statistics suggest that the business mortality of start-ups can be around 70 per cent in the first five years, depending on the specific industry in question (Gruber and Enkel, 2006). Failure for a start-up means closing down (Bruno *et al.*, 1992), divesting through sell-off to another corporation or to individuals (Bruno *et al.*, 1992), or not achieving a worthwhile return on the investments (Crowne, 2002).

Variables affecting start-up failure have been studied in literature with reference to different founder profiles and to different industries (e.g. Cooper *et al.*, 1994) or to a single industry (e.g. Crowne (2002) and Giardino *et al.* (2014) in the software development, and Shah *et al.* (2008) in the micro- and nanotechnology one). Table I displays the main factors driving start-up failure in scientific literature. It highlights the most studied factors and provides a classification based on their underlying similarity in scope.

The classification of determinants of failure in Table I reflects the main start-up features that reveal company’s potential and that are assessed during selections for funding. These features are product or service characteristics, mechanisms of business development, personality characteristics and experience of individuals (entrepreneur/founder team), effects of environmental factors (such as market and financial characteristics) (Wong *et al.*, 2005; Afful-Dadzie *et al.*, 2015).

In general, scholars observed a combination of factors affecting a start-up failure or success – though there is no pre-dominant one – with different interviewed founders attaching varying weights and importance to different factors. In particular, Zacharakis *et al.* (1999) claim that new venture failure is attributable mostly to internal and firm-specific factors. Teal and Hofer (2003) also consider industry structure and dynamics as key determinants.

An innovative product or service attempting to acquire market acceptance (Bruno and Leidecker, 1988) is one of the most important factors to consider when founding a new business. This is strictly linked to an absent or low-level marketing strategy and absence of an awareness of understanding customers’ real needs and subsequently constant customer feedback.

Another requirement investigated by many authors is the attention to financial detail, such as the risk of running out of cash (CB Insights, 2015) or having too many expenses (Shah *et al.*, 2008), even when the new venture succeeds in attracting investors.

Main failure factors	Bruno and Leidecker (1988)	Bruno <i>et al.</i> (1992)	CB Insights (2015)	Cooper <i>et al.</i> (1994)	Crowne (2002)	Duchesneau and Gartner (1990)	References Feinleib (2011)	Giardino <i>et al.</i> (2014)	Rea (1989)	Ries (2011)	Shah <i>et al.</i> (2008)	Song <i>et al.</i> (2008)	Stuart and Abetti (1987)	Teal and Hofer (2003)	Zacharakis <i>et al.</i> (1999)	Total
	<i>Product/service</i>															
Wrong time-to-market	X	X	X		X						X					5
Low level/lack of innovation/technology					X						X	X	X			4
Low or no product/market fit	X	X	X		X		X	X	X		X		X	X		10
(marketable product)											X	X				3
Need for patent protection and licensing/legal issue			X													
<i>Industry</i>																
Unattractive market									X				X	X		2
High-dynamics market/high likelihood of potential entrance of competitors	X		X				X	X				X	X	X		6
<i>Market</i>																
Little (or none) customer feedback/needs/involvement awareness	X		X				X	X		X	X			X		7
Inappropriate marketing/distribution/selling strategy	X	X										X		X		4
Low-marketing intensity/market research			X			X	X					X	X	X		6

(continued)

**Table I.**  
Determinant factors of start-up failure in literature

Open  
accelerators for  
start-ups  
success

Table I.

Main failure factors	Bruno and Leidecker (1988)	Bruno <i>et al.</i> (1992)	CB Insights (2015)	Cooper <i>et al.</i> (1994)	Crowne (2002)	Duchesneau and Gartner (1990)	Feinleib (2011)	References Giardino <i>et al.</i> (2014)	Rea (1989)	Ries (2011)	Ries <i>et al.</i> (2008)	Shah <i>et al.</i> (2008)	Song <i>et al.</i> (2008)	Stuart and Abetti (1987)	Teal and Hofer (2003)	Zacharakis <i>et al.</i> (1999)	Total
	<i>Financial</i>																
High overheads/too late return on investment/run out of cash	X	X	X				X		X					X			6
Initial undercapitalization/low-capital investment	X	X		X	X	X		X							X		7
Little (or none) availability of funding/financial support/interested investors	X	X	X								X	X		X		X	7
<i>Strategy</i>																	
Wrong (or absent) strategy direction/positioning/scope						X				X		X		X			5
Little (or no) focus on business partners/partnerships/potential alliances/networking				X		X					X	X		X			5
Unclear (or no) business plan or business model/narrow Planning breadth/little focus on long-term	X	X	X		X			X	X	X	X	X					8
Lack (or little) use of professional advice				X								X	X	X			4

(continued)

	Bruno and Leidecker (1988)	Bruno <i>et al.</i> (1992)	CB Insights (2015)	Cooper <i>et al.</i> (1994)	Crowne (2002)	Duchesneau and Gartner (1990)	References Feinleib (2011)	Giardino <i>et al.</i> (2014)	Rea (1989)	Ries (2011)	Shah <i>et al.</i> (2008)	Song <i>et al.</i> (2008)	Stuart and Abetti (1987)	Teal and Hofer (2003)	Zacharakis <i>et al.</i> (1999)	Total
<i>Founders team/entrepreneurs</i>																
Loss of focus due to personal or communication and coordination problems/absence of leadership	X		X					X			X		X			5
Little or no entrepreneurial experience				X		X							X			4
Little or no management-specific know-how (e.g. marketing, prior management experience)		X		X		X					X					6
Little or no industry-specific know-how			X							X				X		4
Members' background (education, family, cultural/social diversity, ethics and integrity)		X	X	X							X		X		X	7
Narrow breadth of vision/low flexibility to changes or risk reduction			X			X						X				3
Ineffective team/low qualification/expertise/skills diversity	X	X	X	X		X		X	X		X		X	X		10

Table I.

Also the amount of initial capital is a key issue, since it is related to the initial strategy that is pursued (Cooper *et al.*, 1994).

Finally, as regards the choice of the founders' team members and emergent dynamics, individual skills specialisation (Crowne, 2002) and backgrounds in terms of education – relating to knowledge, skills, problem-solving ability, discipline, motivation, self-confidence – are among the most studied entrepreneurial variables (Cooper *et al.*, 1994).

#### *Start-ups and open innovation*

A key challenge for start-ups is acquiring and exploiting knowledge for decision making. Powell *et al.* (1996) and von Hippel (1988) found that varied access to distributed knowledge is critical for a new venture's performance. This concept is expanded on by Chesbrough (2003) in his argument that the increasing relevance of external resources augurs a new model of open (as opposed to closed) innovation for firms. The considerable advantages of opening up the innovation process to the external context is widely acknowledged in literature (Boudreau and Lakhani, 2009) and proved both in the case of large as well as SMEs (Huizingh, 2011; Avenali *et al.*, 2013; Battistella and Nonino, 2012a,b, 2013; Brunswicker and Vanhaverbeke, 2015).

But do start-ups also benefit from participating in an open innovation environment and in contributing their own resources to their development?

Research on the strategies of firms' participation in open systems remains less developed (Lerner and Tirole, 2005). Waguespack and Fleming (2009) study why a start-up should participate in an open community, proposing ways in which participation might increase a start-up's chances of a liquidity event. These are related to knowledge and reputation (simply attending physical meetings in the community and endorsement of the start-up's technology standard), entrepreneurship/development (openly developing the start-up's technology within the community) and networking (having start-up members elected to leadership positions). Recently, Eftekhari and Bogers (2015) explored how an open approach to start-up creation – purposefully managing knowledge flows across the venture's organisational boundary – can be beneficial to start-up entrepreneurs. They found that ecosystem collaboration, user involvement and an open environment directly influence a new venture's survival, and that their effects are moderated by the entrepreneurs' open mind-set.

Having a solid network is also emphasised as one of the key factors influencing the emergence and successful development of a start-up (Rothschild and Darr, 2005). Networks are critical for the survival and growth of a small firm because they can provide access to information, advice and influence, as well as resources held by others (Hoang and Antoncic, 2003). Given a resource-constrained context, start-up survival and success is dependent on a combination of internal knowledge and external resources (Eisenhardt and Schoonhoven, 1996; Presutti *et al.*, 2011). Diverse external knowledge-sourcing relationships are an important determinant of entrepreneurs' ability to identify more (and more varied) market opportunities (Gruber *et al.*, 2013). In this sense, founders have the possibility to gain access to resources more cheaply by using their network contacts than if they were in a situation where they had to resort to market transactions. The entrepreneurs can acquire resources from the network that would not at all be available via market transactions (Witt *et al.*, 2004).

Physical proximity to other companies can also play a beneficial role, as they can catalyse the entrepreneurial process and also facilitate collaboration among firms (European Commission, 2002). This is related to the fact that the physical incubator environment is conducive to the cross-fertilisation of ideas, advice and networking.

Along this line, the openness to external knowledge sources and the creation of business relationships for innovation have been recognised as two crucial factors in the early stages



of firm development (Carlsson and Corvello, 2011; Kask and Linton, 2013; Eftekhari and Bogers, 2015). Indeed, start-up success can be significantly challenged by the innovation ecosystem in which it is embedded (Nambisan and Sawhney, 2007). In general, acquisition and exploration of external knowledge is strongly affected by the general network (Chesbrough and Bogers, 2014), the frequency of interaction with external partners (Harms *et al.*, 2009) and the management of various and diverse in-flows of new ideas and intellectual property (Chesbrough, 2003; Gruber *et al.*, 2013).

Starting from these assumptions and taking from the reviews of West and Bogers (2014), Chesbrough and Brunswicker (2014) and our own review, the main open innovation practices of SMEs described in the literature were derived. We mostly examined the in-bound and coupled modes of open innovation because we wanted to identify practices that directly benefit start-ups in their early phases of development, without considering the attempts to sell and reveal ideas and technologies in the marketplace (Table II).

Practice	Definition	References
Competitions/awards	Invitation to participate in innovation challenges and submit innovative ideas	Chesbrough and Brunswicker (2014)
Crowdsourcing/ communities	The act of outsourcing a task in the problem-solving process to an undefined crowd (crowdsourcing) or to a specific group (community), in the form of an open call	Almirall <i>et al.</i> (2014), Chesbrough and Brunswicker (2014)
Dyadic co-creation/ co-development in the upstream network	Involvement/integration of one or multiple innovation creators (suppliers) in the innovation process	Burcharth <i>et al.</i> (2014), Chesbrough and Brunswicker (2014), Gassman and Enkel (2004), van de Vrande <i>et al.</i> (2009)
Dyadic co-creation/ co-development in the downstream network	Involvement/integration of one or multiple innovation creators (consumers/customers/users/lead users) in the innovation process	Brunswicker <i>et al.</i> (2012), Chesbrough and Brunswicker (2014), West and Bogers (2014)
Informal external networking	It includes all activities to acquire and maintain connections with external sources of knowledge, comprising both formal, contractual collaborations and more general and informal activities	Chesbrough and Brunswicker (2014), Oliveira and Alves (2014), van de Vrande <i>et al.</i> (2009)
Information networking/collecting information from external sources	Searching the internet for new trends or technology, reading technical magazines, collecting information from other organisations	Burcharth <i>et al.</i> (2014)
Mass customization	Production of products which have been customised by the customer at production costs similar to those of mass-produced products	Stoetzel (2012)
R&D collaboration and technology alliances/consortia	Cooperation (without equity involvement) between non-competing firms with the aim of pursuing a common innovative objective	Bianchi <i>et al.</i> (2011), Chesbrough and Brunswicker (2014), Gassman and Enkel (2004), West and Bogers (2014)
Technology brokering	To scan multiple, otherwise disconnected industries, to see how existing technologies could be used to create breakthrough innovations in other markets	Hargadon and Sutton (1997)
Research grants	Funding of external research projects by researchers and scientists in universities (faculty, PhD students, or post-doctoral fellows) to access external knowledge	Chesbrough and Brunswicker (2014)

**Table II.**  
Main in-bound  
and coupled  
open innovation  
practices in SMEs

*Start-ups and accelerators*

Accelerators are a recent and rising phenomenon, driven by the changing economics of early-stage start-ups, especially tech ones, which benefit from a dramatic decrease in the costs of experimentation (Pauwels *et al.*, 2015). From the first Y Combinator founded by Graham in 2005 – defined as the most successful and copied accelerator (Christiansen, 2009; Pauwels *et al.*, 2015) – these new kinds of incubating organisations, meant for new ventures, are rapidly growing in number and expanding from the USA to Europe (Christiansen, 2009; Cohen and Hochberg, 2014).

Accelerators derive many of their characteristics from business incubators, focussing on firms at the earliest stage of development and providing them with entrepreneurial support services, but their programmes have distinguishing characteristics (Miller and Bound, 2011; Cohen and Hochberg, 2014; Pauwels *et al.*, 2015). In particular, they provide a time-limited and intense mentorship and education programme, allowing entrepreneurs to focus their attention and to reduce dependence on the seed accelerators, thus leading to quicker growth or quicker failure – which can be beneficial in moving to a higher value opportunity (Cohen and Hochberg, 2014). The application process is worldwide, open and highly competitive, and it focusses on small teams – with technical background (Christiansen, 2009) – that are further involved in classes or batches of start-ups. Moreover, they provide pre-seed investment, in exchange for equity stakes in participating ventures. Many accelerators are indeed for-profit (Isabelle, 2013) and private owners often have extensive experience as entrepreneurs or angel investors (Cohen and Hochberg, 2014), who are considering their portfolio perspective (Kim and Wagman, 2014). Finally, the most valuable aspect is the provision of intense mentoring and advice, and of numerous networking opportunities with investors and other start-ups, all being embedded in a supportive peer-to-peer environment and entrepreneurial culture (Christiansen, 2009; Hoffman and Radojevich-Kelley, 2012; Cohen and Hochberg, 2014).

In this sense, successful accelerator programmes have demonstrated that they have a key role to play in boosting the local start-up ecosystem they belong to and acting as focal points for introducing and building new network ties between founders, investors and other stakeholders (Miller and Bound, 2011). Even though the phenomenon has received growing interest from practitioners, previous research (e.g. Grimaldi and Grandi, 2005; Lendner and Dowling, 2007; McAdam and Marlow, 2007; Schwartz, 2013) has mostly focussed on incubators and their role in addressing start-up failure.

Literature on accelerators has only recently received attention (Miller and Bound, 2011; Cohen and Hochberg, 2014; Isabelle, 2013; Kim and Wagman, 2014; Malek *et al.*, 2014; Pauwels *et al.*, 2015). For example, Miller and Bound (2011) conducted the first profound study on the evolution, benefits and business models of accelerators and their programmes, but they did not focus on the services and tools offered to start-ups. Later, Cohen and Hochberg (2014) compared the key features of accelerators with those of incubators and angel investors in terms of programme duration, business model and education and mentorship offered while Isabelle (2013) focussed on how these differences influence a new entrepreneur's choice in joining them. Malek *et al.* (2014) identified key capabilities of accelerators classifying them as R&D focussed, technology enabled, market enabled and network enabled, limiting them to clean tech industry. Kim and Wagman (2014) focussed on the financial perspective with a model on the choice of portfolio. Finally, Pauwels *et al.* (2015) delineated different models of accelerators based on heterogeneity of strategies and operations – the “ecosystem builder”, the “deal-flow maker” and “welfare stimulator” – but they did not investigate the effects of different types of organisations on accelerated start-ups. Therefore, a profound analysis of accelerator practices and their impact on start-ups participating in the programme – and their survival – is still lacking.

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## Methodology

### *Research gap and questions*

Scientific literature on accelerators is only recent and lacks comprehensive data sources (Cohen and Hochberg, 2014) and a consistent theoretical lens to study the phenomenon (Pauwels *et al.*, 2015). More attention to the impacts on new ventures participating in incubation or acceleration programmes is also required (Isabelle, 2013).

Start-ups' success can be significantly challenged by the innovation ecosystem in which it is embedded (Nambisan and Sawhney, 2007). Openness as a way to accelerate internal innovation activities has attracted increasing attention in both research and practice (West and Bogers, 2014). In this sense, scholars (e.g. van de Vrande *et al.*, 2009; Lee *et al.*, 2010) call for further research in open innovation field in order to fully understand how its adoption can play a role in different types of SMEs – e.g. start-ups – and in different phases of companies' growth.

This paper aims to address the gaps identified in open innovation (as regards the implications of openness to external knowledge sources for start-ups) and in new ventures (as regards implications of participation in an accelerator programme) literature, by investigating how the open environment offered by the accelerator can mitigate start-up failure. We formulated the research question as follows:

*RQ.* How do accelerators mediate open innovation practices to address potential start-up failure?

### *Case selection*

Given the absence of literature on accelerator practices for supporting start-ups, the first step in the research was based on Seed-DB, an online database of accelerators and their graduated companies, and onFS6.com, an online platform that supports a community of accelerators, potential investors and other funding institutions for start-up owners. From these sources, we identified the first list of potentially interesting cases, starting from their specific descriptions. In this case, the selection was restricted to the organisations that fully fit the key features of accelerators identified in literature (Christiansen, 2009; Miller and Bound, 2011; Cohen and Hochberg, 2014; Pauwels *et al.*, 2015) as the following:

- (1) an open, rigorous and highly competitive application process;
- (2) limited-duration and intensive programmes (lasting around three months);
- (3) involvement of batches or classes of start-ups instead of individual ones, and generally;
- (4) offering of pre-seed investment in exchange for equity stakes; and
- (5) ending with a public pitch event or “demo day”.

Since accelerators were shown to have a specific geographical focus and to operate autonomously at the local level (Pauwels *et al.*, 2015), we further added the criterion of selecting institutions located in a single, specific country. As a country base we selected the UK, which stands out as one of the most attractive thanks to: the special working visa promoted by the government for foreign company founders accepted onto an English accelerator programme (Miller and Bound, 2011), the important presence of business angels and venture capitalists that perform better than those in the USA in terms of return on investments (Lerner *et al.*, 2011) and the acknowledgement of London as one of the leading accelerator regions in Europe (Pauwels *et al.*, 2015).

The data set resulting from the research on online databases includes 24 accelerators from the UK. From this data set, we selected a single case study with the following criteria:

including the widest list of services and which fell within the median range when compared with other accelerators (as regards initial investment, share of equity required, programme duration and number of accelerated start-ups).

### *Research method*

With the aim of gaining a comprehensive understanding of how the open attitude within the accelerator influences a start-up's survival (or even success) by mitigating the probability of failure, we conducted an exploratory and inductive case study (Eisenhardt, 1989; Yin, 2009).

As there has been limited prior research into the themes connected to open innovation and accelerators, they must still be explored in-depth, taking into consideration also the complex system of variables that characterize the observed phenomenon (Handfield and Melnyk, 1998). Along the same line, the object of the case study is the open innovation practices of the accelerator. The choice of the single case study is appropriate for explorative investigations (McCutcheon and Meredith, 1993) and it is coherent with the aim of a study that seeks to understand a phenomenon of a dynamic nature and with a possibly uncertain process (Yin, 2009).

From the data set obtained in the previous section, we selected the English accelerator Searchcamp. The case study was analysed by tracking the 12 week accelerator programme offered in 2013, where eight early-stage internet start-ups were selected.

The analysis initially highlighted the services offered by the accelerator, from the provision of office and co-working space to mentorships. We then explored the main tools adopted specifically for each practice.

The results from this step were integrated with data collected in semi-structured interviews with the programme director and the founder team of one of the start-ups that had successfully completed the programme. Since accelerator programme continuation is based on the start-ups it invests in being successful (Miller and Bound, 2011), we argue that focussing on the best performing one provides a better insight into the advantages of the open environment offered by the accelerator from the point of view of start-ups.

Finally, we evaluated the accelerator tools and practices and their potential to mitigate possible failure from an open innovation perspective, based on primary and secondary data.

### *Data collection*

Multiple data collection methods were adopted to acquire a profound understanding of the dynamics involved. The aim was twofold: to increase the information base and to diversify data in order to reduce biases (Patton, 2002). The documentation involved was semi-structured interviews, questionnaires, company documents and secondary data (press reviews and official company documents such as website and archival documents). The role of the interviewees were: corporate executive, start-up mentor and start-up founders. Interaction was based on two full days on site, three interviews of one hour each (two with the programme director/CEO and one of the mentors of Searchcamp, one with the four founders of the successful start-up and two follow-up phone calls).

The use of a qualitative empirical study methodology requires the definition of a research protocol selected in order to make a comparison and to facilitate the aggregation of data collected. The protocol of the analysis was developed prior to data gathering and was based on the literature review. It was composed of the following parts:

- General description: aims of the accelerator, main features, stakeholders, opportunities, etc.
- Services and tools of the accelerator.
- Practices of open innovation in the accelerator.

## Findings

Among the accelerators listed in the final database, Searchcamp offers one of the most complete packages, including supplementary services for the personal needs of team members, i.e. room and board, meeting rooms and prepaid server services. As in other accelerators, initial investment supports the opening costs of the start-up process, allowing co-founders to keep their focus on the development of their business, without having to look for a second job (Miller and Bound, 2011). The amount of initial investment is limited (Christiansen, 2009; Pauwels *et al.*, 2015): just €20,000 (£15,000), whereas it normally varies from €16,000 to 30,000. In return for this initial investment, Searchcamp acquires 10 per cent of the start-ups' shares (while in other accelerators it goes from a minimum of 5 per cent to a maximum of 15 per cent) – aiming at an economic return after start-up acquisition by an incumbent firm (Cohen and Hochberg, 2014).

Searchcamp provides an intense and time-limited programme (Cohen and Hochberg, 2014) of three months, involving eight start-ups per batch. This fosters peer-to-peer learning (Pauwels *et al.*, 2015) and the sharing of experiences and emergent ideas on the one hand, and of some kinds of expenditure, e.g. legal costs, on the other. (Miller and Bound, 2011). Aside from the provision of office and co-working space tailored for start-ups (Miller and Bound, 2011; Hoffman and Radojevich-Kelley, 2012), networking and mentoring are the most valuable support they provide. As reported by Cohen and Hochberg (2014), the aim is to cover a lack in general management and entrepreneurial skills more than just specialisation in a very specific industry or sector. In particular, networking activities are divided according to their scope into:

- (1) Tax and legal advice: a network of consultants, law and tax firms with consolidated experience in the field. Accelerators grant packages of services beneficial to start-ups. In Searchcamp this allows the start-up to have an established company from the first day of the programme and access to administrative and legal support at a favourable rate for the whole period.
- (2) Start-ups: the accelerator organises monthly meetings and special events (that can also be competitions, such as hackatons) where participating start-ups have the opportunity to meet entrepreneurs, professionals and start-ups from the same or from different industries in order to share information and feedback on their respective activities and to create new potential synergies.
- (3) Investors: most accelerators have their own network of business angels and venture capitalists willing to provide funding to the most promising start-ups participating in the programme. The Searchcamp investors are the same ones providing the initial investment to the selected ventures and they have daily access to the co-working space.
- (4) Tech partners: accelerator partners that support the technical development of the product or service, e.g. with testing and prototyping services. In Searchcamp the chief technology officer (CTO) is available for technical consultation about three days a week. The collaboration during the programme can be further developed into long-term partnerships for product or service co-development between successful start-ups and tech partners who become first-level suppliers.

As regards mentoring activities, we distinguish between:

- (5) Education/workshops: workshops and Masterclasses dedicated to specific issues – both technical and industry-related and dedicated both to management and entrepreneurial topics – and delivered by coaches, entrepreneurs and technical experts. In the accelerator of our study, the Masterclasses take place in the co-working space and involve all teams, focussing on the practical perspective and fostering the sharing of best practices among participants.

- (6) Mentorship: mentors work in very close contact with start-up founders during the whole programme offering advice, recommendations and feedback, all based on their previous experience as entrepreneurs. Start-ups in Searchcamp are provided with advice on both technical and more informal aspects (such as entrepreneurial behaviour and ways to present their business) and a range of practices and tools mentors have successfully adopted in their entrepreneurial journey. Mentors also play a key role during the selection process.

In Table III specific tools adopted by the Searchcamp accelerator for each above-mentioned service are listed and described, with representative quotes from interviews.

From the initial eight start-ups accepted into the programme, two ventures were not able to conclude the programme as planned for legal reasons. After almost two years from its completion, an investigation into the six start-ups that completed the whole programme revealed that one is still operating with good economic results and that an incumbent firm successfully acquired two of the others. The remaining three failed (due to high expenditure) after the conclusion of the accelerator programme (Miller and Bound, 2011) and had to cease their business activity.

In the following pages, the efficacy of accelerator tools is discussed in one of the firms, namely Tangle Labs, which was successfully acquired at the end of the programme. This start-up was founded by four engineering and computer science students – a small team with a technical background (Christiansen, 2009) – with the aim of developing an application for business dating, based on geo-localisation and on people's genuine interest in meeting up with other business people during the course of events such as conferences and business meetings. During their accelerator course, they succeeded in properly changing product and target market in an online application for dating people identified as interesting and met during the day.

The founders worked on the development of their product seven days a week in the office space provided, where they could benefit from peer-to-peer interaction and cross-learning from experiences and knowledge shared with other teams. The office was also often used to meet advisors and mentors in order to further consolidate relationships and benefit from their advice in an informal environment.

Potential investors from the Searchcamp network, such as business angels, venture capitalists and other entrepreneurs (Kim and Wagman, 2014), also regularly visited the co-working space in order to thoroughly know the different business ideas and to monitor their progress. Tangle Labs succeeded in attracting two investors, and thanks to the funding provided they were able to improve their product and test marketing actions, which allowed them to further improve their product and ensure that it matched the market.

Due to its focus on internet start-ups, a resident CTO and numerous computer engineers made up the Searchcamp tech network. The Tangle Labs team was able to benefit from the co-development of their product with computer experts who helped to improve the programming language at the basis of the application. Teams also had the opportunity to participate in demo days where they presented their product or service idea to a larger audience of investors (Hoffman and Radojevich-Kelley, 2012; Cohen and Hochberg, 2014). One of these events was organised in the Google Campus in London, where the start-up founders had the opportunity to meet other experts who provide online functions to Google.

The present and the past teams of the Searchcamp programme and a group of mentors founded a community of practice located in Middlesbrough. This represented another valuable opportunity to share expertise and experiences among professionals and other actors in the same industry, and to strengthen network ties between founders, investors and other stakeholders (Miller and Bound, 2011).

Regarding start-up members' education, the workshops and lessons delivered focussed on both technical (such as software development) and managerial issues (such as how to

Services	Tools and practices	Representative quotes
Provision of office and co-working space	Office space	Office space tailored for start-ups to which founders have 24 h access to work on their business/product/service development and to meet external partners
Tax and legal advice networking	SEIS application	Registration to national Seed Enterprise Investment Scheme (SEIS) programme that incentivises investments by providing tax cuts for people and institutions investing in early-stage start-ups
	Tax and legal advice	Advice and face-to-face meetings with experts on legal issues such as intellectual property, trademarks, privacy policy, terms and conditions for websites, value added tax (VAT) registration, societal and personal obligations
Start-up networking	Local press and websites	Promotion of participating start-ups in local press and industry websites
	Start-up community events	Participation in local and national events with other start-ups and entrepreneurs from the same industry
Investor networking	Investor meetings	Face-to-face meetings in the office space with investors, such as business angels and venture capitalists
	Demo days	Events where start-up founders present their product or service to an audience of investors
Tech partner networking	Chief technology officer (CTO) and computer experts	Resident (or coming to office space) experts in computer science

(continued)

**Table III.**  
Services and tools  
in Searchcamp  
accelerator

Services	Tools and practices	Representative quotes
Education/ workshops	The Value Proposition Canvas	It helps to describe explicitly how the company's product or service creates value for the customer (Osterwalder and Pigneur, 2010). It helps in raising awareness of product/market fit by highlighting "gains" and "pains" both for the company and for potential customers
	The Business Model Canvas	"We did the master-class after a month; it's necessary to understand the customer – and you know your customer when you have awareness of your product" (start-up team)
	The Lean start-up Loop	"On the first day teams were asked to fill in the Canvas with post-its. They could then change it dynamically during the programme" (mentor) "The Business Model and each start-up's contacts were visible to everyone in order to facilitate the best information sharing" (CEO)
	The Kanban Board	"We contacted experts from the Lean Startup community [...]. We can say that the whole route is based on the Lean Start-up philosophy" (CEO)
	The four steps to customer development	"We had specialised masterclasses and books to read. We were advised on studies to do, on how to use these tools in a valuable and proper way. For example we had another class in London about analytics to improve our technical level" (start-up team)
	Analytics tools Masterclass	Process of four steps: customer discovery (identification of a business idea that can solve a real problem), customer validation (evaluation of idea marketability), customer creation, company building (transforming idea into a real business) (Blank and Dorf, 2012)
		Advice on how to implement analytics systems to study customer behaviour

Table III.

*(continued)*



Table III.

Services	Tools and practices	Representative quotes
	Customer interviews and feedback	Advice on how to implement collecting feedback systems, complaints and specific customer needs
	Sales and marketing Masterclass	Advice on how to improve sales, marketing and distribution strategy
	Facebook advertising Masterclass	Advice on how to use "Facebook for Business" tool that allows companies to create commercial sections and advertisements and to elaborate information on user preferences in order to deliver more valuable and customised products or services
	Raising capital Masterclass	Advice on how to attract investors and obtain funding
Mentorship	Mentors feedback	Face-to-face meetings with mentors (also external) in order to constantly collect feedback and advice "Start-up teams were advised and mentored by myself and other renowned and high-level experienced business men and women. We provided timely feedback to the guys on all possible product implementations, business improvements [...] any kind of issue from our field" (mentor)
	Pitch coaching	Preparation for the "pitch", namely a brief speech to convince audience of investors and other potential partners of product/service innovative value "This was an incredible learning experience for the teams" (CEO) "There was the director and another coach who followed your presentation, then a board that recorded you to highlight things that were not right" (start-up team)

properly develop a business model following Osterwalder and Pigneur's (2010) method). For instance, in Tangle Labs case, lessons on analytic tools were useful as members learnt how to adopt them in order to monitor the number, localisation and behaviour (e.g. time spent on the application and actions taken) of the application users on a daily or weekly basis. Advice on the strategic tools available, the importance of customers' needs and choosing the right marketing strategy led the start-up team to conduct numerous interviews in order to identify their target market, which they found out to be young people between 18 and 34 years of age. Potential customer feedback and questionnaire results showed that 30 per cent of the sample had difficulty in approaching a new person face-to-face and 70 per cent regretted not having the opportunity to get in touch with a person they had met during the day. This data were further elaborated with outputs obtained in the system for monitoring customers' behaviour in order to improve product marketability.

Finally, the intense interaction with the pool of high-quality mentors offering support and the sharing of experiences of entrepreneurs (Cohen and Hochberg, 2014), allowed the consolidation of the knowledge acquired during the programme and its systematic application. Tangle Labs demonstrated that it was able to recognise the value of the whole contribution offered by the accelerator, to assimilate it and then to apply it in improving their product and their business strategy. This resulted in their successful acquisition by a Scottish corporation in June 2014.

## Discussion

While proposing innovative products and services, start-ups lack market visibility, as well as “connectedness” to resource networks and need support in promoting innovation and entrepreneurship (Wong *et al.*, 2005). Finding investors and other partners increases the probability of a start-up’s survival, as they provide vaster and more profound expertise, experience and resources (Cooper *et al.*, 1994). In our case study, the teams participating in the Searchcamp programme were mostly composed of people with heterogeneous competences. Heterogeneity was a key requirement for selection, but the teams’ competency still needed to be improved, as they were at the early-stage of product and business development.

In this sense, accelerators play the role of intermediary between the new ventures and the external sources of knowledge and resources that support their development process. Searchcamp provides access to information, advice and the influence of a network (Hoang and Antoncic, 2003) of high quality, external experts and entrepreneurs, as well as resources offered by venture capitalists and angel investors. These actors are willing to share their experience and knowledge and to offer their money to support start-ups that have been judged as innovative and that have a high potential to grow successfully (Miller and Bound, 2011) and to identify more (and more varied) market opportunities (Gruber *et al.*, 2013).

Opening up the innovation process to external sources is at the basis of the open innovation paradigm as theorised by Chesbrough (2003). Along this line, the efficacy of the support offered by accelerators from the participating founders’ point of view can be evaluated from an open innovation perspective.

In Table IV the main services and tools of the Searchcamp accelerator are cross-checked with SME practices of open innovation in the literature in order to highlight their validity as regards open innovation in start-ups.

It emerges that the services offered by the accelerator meet most of the practices generally adopted by SMEs when opening up their innovation process. For example, in the case of Searchcamp, the competitions such as demo days and hackatons allowed the comparison of innovative ideas and the collection of feedback from other start-ups and entrepreneurs. Only mass customisation does not find a correspondence in the accelerator tools, since it presumes the direct involvement of customers in the process of innovation (Stoetzel, 2012) and it strictly depends on the start-ups’ main business. All the teams involved in the Searchcamp programme were internet start-ups in the early phases of development, and thus, far from reaching customers on a large scale.

It is also to be noted that the practices and tools offered by the accelerator that are not directly linked to open innovation practices mostly concern technical and strategic issues that do not foresee the use of external sources of knowledge to innovate business. For instance, the Kanban Board is focussed on optimising workflows, and tax and legal advice are strictly connected to bureaucratic issues.

Other practices are linked to networking and external knowledge acquisition that benefit new ventures in developing their product or service, and thus, their business. The 24 h access to the a common office space offered by Searchcamp allowed daily, face-to-face meetings with mentors and coaches and was a valuable knowledge source to improve team competences. Moreover, events such as demo days and local start-up community meetings represented a valuable opportunity to practice informal networking and technology brokering, to get into contact with potential partners for future collaboration and to learn from innovative solutions developed by experts in other new ventures.

In actual fact, at the end of the accelerator programme the start-ups had created their own network, which was made up of expertise and experience from different areas, and even from different industries. In Searchcamp the same mentors, tech experts and other entrepreneurs involved in the programme became the co-developers of the innovative

Service	Tools and practices	Competitions/ awards	Crowdsourcing/ communities	Dyadic co-creation/co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Open innovation				Technology brokering	Research grants	
						Informal external networking	Information collecting/ information from external sources	R&D collaborations and technology alliances/ consortia	Mass customization			
Provision of office and co-working space	Office space			X	X	X	X	X		X		
Tax and legal advice	SEIS application											
networking	Tax and legal advice											
Start-up networking	Local press and websites					X		X				
	Start-up community events	X				X		X		X		
Investor networking	Investor meetings	X				X		X		X		X
	Demo days	X				X		X		X		X
Tech partners networking	Chief technology officer (CTO) and computer experts			X		X		X		X		X
Education/ workshops	The Value Proposition Canvas			X								

*(continued)*

Open accelerators for start-ups success

**Table IV.**  
Tools and practices of accelerator as open innovation practices

Table IV.

Service	Tools and practices	Competitions/awards	Crowdsourcing/communities	Dyadic co-creation/co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Open innovation			R&D collaborations and technology alliances/consortia	Technology brokering	Research grants
						Crowdsourcing/communities	Informal external networking	Information networking/collecting information from external sources			
The Business Model				X	X						
Canvas											
The Lean start-up Loop											
The Kanban Board											
The four steps to customer development			X		X						
Analytics tools											
Masterclass											
Customer interviews			X		X						
and feedback											
Sales and marketing			X		X						
Masterclass											
Facebook advertising			X		X						
Masterclass											
Raising capital											
Masterclass											
Mentors feedback								X		X	X
Pitch coaching									X		X

product/service proposed by the participating start-up. Integration of feedback and suggestions collected from the creators (i.e. the advice from the CTO and other tech partners) and from the users (e.g. through customer interviews) of the innovation process (Chesbrough and Brunswicker, 2014) enabled both further technical improvements in the new product or service, as well as helping to make it marketable. As a result, Tangle Labs was able to morph its product in an online dating application and to improve it up to the point of its successful exit.

The following table helps in further formulating the link between the open innovation practices mediated by accelerator tools and practices and the main potential causes of start-up failure that they are supposed to address.

In Table V, we show the open innovation practices mediated by the accelerator and the ones that are not covered, but that can be beneficial to a start-up's survival. For instance, informal external networking with Searchcamp's main partners helped teams in opening up their strategy to collaboration in the innovative ecosystem and in leveraging external know-how to boost business development. R&D collaboration, as well as product or service improvements, all of which can also be pursued outside accelerator boundaries by leveraging a stronger market share in case of high-dynamics market – as the one attained by Tangle Labs with Google in order to access some of their online functions.

On the other hand, opening up the innovation process does not mitigate against all the main causes of failure. The intrinsic characteristics of founder teams do not seem to be addressed by an open approach, and neither does participation in an accelerator programme. In particular, personal background and problematic relationship dynamics within the team are not affected by the availability of external expertise. While Searchcamp evaluates a team's strengths and potential to develop its own business during the selection process, and can help to improve their technical and managerial skills, internal coordination problems within some of the start-ups outlived the programme and the start-up later failed.

The most effective practices, such as dyadic co-creation with accelerator network partners and crowdsourcing, have been revealed to mostly address the lack of, or a wrong direction in the product, marketing and relative managerial abilities, which a start-up does not usually possess due to its "newness". At the end of the programme, Tangle Labs team declared that they had become aware of the importance of building an open mind-set (Eftekhari and Bogers, 2015) and focussing strategy, not only on customer value, but also on building a proper network to foster purposeful knowledge exchanges.

Having answered our research question, we can formulate the following proposition:

- P1.* Open innovation practices facilitated by the tools and practises offered by accelerator programmes address specific potential causes of failure in start-ups participating in their programme, in particular those concerning product or service characteristics, target market/needs awareness, strategic focus and relative managerial and industry-specific know-how.

## Conclusions

For a start-up, newness and smallness result from a lack of specific roles and capabilities (de Jong and Freel, 2010) and in scarce resources (mainly human and financial) to structure the innovation process (Dahlander and Gann, 2010; Grimaldi *et al.*, 2013). These are real challenges for the start-up itself and also for the intermediary organisations (accelerators, incubators, policy system, etc.) involved. An open innovation approach (Chesbrough, 2003) can mitigate many of these problems by constructing knowledge and capabilities (De Toni *et al.*, 2016) and building new relationships, thus having an indirect effect on the survival chances of the new venture (Eftekhari and Bogers, 2015). In this sense, the open environment offered by an accelerator can facilitate many practices that directly benefit

**Table V.**  
Open Innovation  
practices and  
accelerators tools for  
mitigating start-up  
failure

Main failure factors	Open innovation practices				Accelerator tools and practices outside open innovation
	Dyadic co-creation/co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Informal external networking	Information networking/collecting information from external sources	
<i>Product/service</i>					
Wrong time-to-Market		X	X	X	
Low level/lack of innovation/technology	X				X
Low or no product/market fit (marketable product)	X	The Value Proposition Canvas		X	The Lean start-up Loop Tax and legal advice
Need for patent protection and licensing/legal issue					
<i>Industry</i>					
Unattractive market		X			Analytics tools Masterclass
High-dynamics market/high likelihood of potential entrance of competitors		X			X
<i>Market</i>					
Little (or none) customer feedback/needs/involvement awareness	Customer interviews/feedback; the four steps to	Customer interviews/feedback; the four steps to	Start-up community events	X	The Lean start-up Loop; analytics

(continued)

Main failure factors	Open innovation practices				Accelerator tools and practices outside open innovation
	Dyadic co-creation/co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Information networking/collecting information from external sources	R&D collaborations and technology alliances/consortia	
Competitions/awards	Crowdsourcing/communities		Mass customization		Research grants
	customer development	customer development			tools
Inappropriate marketing/distribution/Selling strategy	Sales and marketing; Facebook; advertising	Sales and marketing; Facebook; advertising	X	X	Masterclass
Low-marketing intensity/market research	Masterclass	Masterclass			
<i>Financial</i>	Sales and marketing	Sales and marketing	X		
High overheads/late return on investment/run out of cash	Masterclass	Masterclass			
				X	Tax and legal advice; The Business Model Canvas
Initial undercapitalization/low-capital investment					
Little (or no) availability of funding/financial					Raising capital
					Masterclass

(continued)

Table V.

Main failure factors	Open innovation practices						Accelerator tools and practices outside open innovation
	Competitions/ awards	Crowdsourcing/ communities	Dyadic co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Information networking/collecting information from external sources	R&D collaborations and technology alliances/ consortia	
support/interested investors							
<i>Strategy</i>							
Wrong (or absent) strategy direction/ positioning/scope			X	X			The Business Model Canvas
Little (or no) focus on business partners/ partnerships/ potential alliances/ networking				Investor meetings; demo days; start-up community events			CTO and computer experts
Unclear (or no) business plan or business model/ narrow planning				X			The Kanban Board
breadth/little focus on long-term					X		
Lack (or little) use of professional advices				Office space	Office space	Office space	
<i>Founders team/entrepreneurs</i>							
Loss of focus due to personal or							

(continued)



Main failure factors	Open innovation practices				Accelerator tools and practices outside open innovation
	Dyadic co-creation/co-development in the upstream network	Dyadic co-creation/co-development in the downstream network	Informal external networking	Information networking/collecting information from external sources	
communication and coordination problems/absence of leadership				R&D collaborations and technology alliances/consortia	Research grants
Little or no entrepreneurial experience	X				Technology brokering
Little or no management-specific know-how (e.g. marketing, prior management experience)	The Value Proposition Canvas; The Business Model Canvas	The Value Proposition Canvas; The Business Model Canvas; The four steps to customer development; customer interviews/feedback; sales and marketing Masterclass; Facebook advertising Masterclass	Start-up community events	Mass customization	Research grants
Little or no industry-specific know-how	X	CTO and computer experts	CTO and computer experts		CTO and computer experts

*(continued)*

Open accelerators for start-ups success

Table V.

Main failure factors	Open innovation practices				Technology brokering	Research grants	Accelerator tools and practices outside open innovation
	Competitions/ awards	Crowdsourcing/ communities	Dyadic co-creation/development in the upstream network	Dyadic co-creation/co-development in the downstream network			
Members' background (education, family, cultural/social diversity, ethics and integrity)							
Narrow breadth of vision/low flexibility to changes or risk reduction			X	X			
Ineffective team/low-level qualifications/expertise/skills diversity			CTO and computer experts	CTO and computer experts			
					X		
							The Lean start-up Loop, The KanBan Board

start-ups in their early phases of development. In particular, in the case study, participation in an accelerator programme proved to be more effective in this sense in start-ups formed by an open-minded team, which was able to overcome internal shortages in terms of market-, strategic and industry-related competences.

### *Implications and limitations*

This work has important practical implications both for founders of early-stage ventures and for accelerators and other supporting institutions. By demonstrating the key role of accelerators in enhancing open innovation practices for start-ups, it offers a valuable perspective for entrepreneurs on the ways of obtaining the knowledge and the resources needed to fulfil their business potential better. Even before evaluating the possibility of applying for an accelerator programme, start-ups should be aware of their business status. In this sense, the list of the most important failure drivers presented in Table I can represent an initial checklist for potentially avoiding failure (Bruno and Leidecker, 1988), and redirecting the start-ups' strategic process of evolution. Moreover, a deeper understanding of these factors allows more effective policies to be drawn up in order to encourage and stimulate entrepreneurial activities with growth potential.

From a literature point of view, the results obtained revealed that the open environment offered by the accelerator can map out the effort involved on the part of a start-up in creating an innovative product or service in collaboration with partners, and have an effect on potentially mitigating start-up failures.

Compared with previous studies, this work adds to the literature at three levels:

- (1) Start-ups and failure: we systematised the literature into a single framework and we provided a comprehensive view of possible reasons for start-up failure, adding a perspective on open innovation as a determinant for mitigating possible problems to the literature (e.g. Wong *et al.*, 2005; Afful-Dadzie *et al.*, 2015).
- (2) Start-ups and open innovation: we provided a new perspective that does not build from the point of view of how start-ups contribute to large corporations (e.g. Chesbrough, 2003; Carlsson and Corvello, 2011; Grimaldi *et al.*, 2013; West *et al.*, 2014; Brunswicker and Vanhaverbeke, 2015), but from the point of view of the start-up itself, and how it can be helped by open innovation practices, to avoid certain causes of possible failure. We showed how, in the literature, and in our case, the success of the start-up depends on external knowledge flows and on being embedded in an open environment.
- (3) Start-ups and accelerators:
  - we added to Miller and Bound (2011) an in-depth study on, not only accelerator programmes, but also services and tools offered to start-ups;
  - we added to Isabelle (2013) and to Cohen and Hochberg (2014) not only a list of the key features of accelerators, but their effects in terms of mitigation of start-up failure and open innovation;
  - we added another perspective to Malek *et al.* (2014) on a different industry, not showing capabilities but practices, and to Kim and Wagman (2014) a business model perspective and not a financial one; and
  - we added to Pauwels *et al.* (2015) the effects on accelerated start-ups.

The main limitation of the study is that it is based on a single case study. Future work of the authors will be directed towards multiple case studies and a profound investigation into single failure factors within an open innovation approach.

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