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Speedboating into the Future -

How Organizations Use Open Foresight and Business Incubation as Strategic Means to Explore Trends and Promote Innovation

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Overview of Dissertation Papers

Dissertation Paper I		
Open Foresight: Exploiting Information from External Sources		
Authors		Daniel Ehls; Sabrina Korreck; Reimo Jahn; Michael Andreas Zeng; Sara Heuschneider; Cornelius Herstatt; Hans Koller; Sebastian Spaeth
Status	Conference Presentation	Paper has been accepted and presented by one of the co-authors at: *24th Innovation and Product Development Management Conference (IPDMC)*, Reykjavik, Iceland, June 2017
	Publication	This paper is available at SSRN: https://ssrn.com/abstract=2764208 or http://dx.doi.org/10.2139/ssrn.2764208

Dissertation Paper II		
Opening up Corporate Foresight: What Can We Learn from Open and User Innovation?		
Authors		Sabrina Korreck
Status	Conference Presentations	The paper has been presented in internal project meetings.
	Publication	The paper has been submitted to the Journal of Innovation Management (JIM).

Dissertation Paper III		
Business Incubators and Accelerators: A Co-Citation Analysis-Based, Systematic Literature Review		
Authors		Piet Hausberg, Sabrina Korreck
Status	Conference Presentation	Paper has been accepted and presented by the co-author at: *Academy of Management Conference (AOM)*, Atlanta, USA, August 2017
	Publication	This paper has been published in the Journal of Technology Transfer (VHB-JQ3: B) and is available online (open access) at: https://doi.org/10.1007/s10961-018-9651-y

Dissertation Paper IV		
Speedboating into the Future: How the Recent Breed of Corporate Venturing Units Promotes Corporate Innovation Strategy		
Authors		Sabrina Korreck, Piet Hausberg
Status	Conference Presentations	Paper has been accepted and presented by one of the authors at: *Lehrstuhlübergreifendes Innovationssymposium (LUIS)*, Hamburg, November 2015 *DRUID Conference*, New York, June 2017 *Lehrstuhlübergreifendes Innovationssymposium (LUIS)*, Kiel, September 2017 *G-Forum Interdisciplinary Entrepreneurship Conference*, Wuppertal, October 2017

Summary of Dissertation

The starting point of this cumulative dissertation is the observation that, nowadays, organizations find themselves in a fast-paced and increasingly complex and uncertain environment. Therefore, understanding weak signals and developments that may affect them in the medium to long run is important to build up "strategic preparedness" (Ansoff, 1975). For this purpose, foresight represents a promising approach. Recently, the concept of open foresight has been introduced in the literature to describe an opening of the process by tapping into external knowledge sources.

(Open) Foresight does not only lead to understanding possible futures, but should also derive implications for action and trigger appropriate organizational responses, e.g. by initializing innovation projects. However, established firms often encounter difficulties in fostering innovation. As one possible approach to address this situation, Corporate Venturing Units (CVU) have long been used to hatch internal innovations or support external startups through financial investments. Yet, it seems that a new wave of CVUs with a stronger strategic orientation is emerging, which seek to leverage external ventures in a more cooperative way. Some incumbents set up incubators and accelerators to support external startups, while entering in exchange and collaboration with these in order to benefit from their innovativeness. Other established firms founded company builders, which focus on generating, validating and implementing their own internal ideas, while also being very externally oriented through interacting and partnering with actors in the startup ecosystem.

Research on the outlined topics is still in an early stage and some open questions will be investigated in this cumulative dissertation. The four papers partly build on one another and complement each other. Overall, the dissertation seeks to provide a holistic perspective to the overarching question: How do organizations use open foresight and business incubation as strategic means to explore trends and promote innovation?

Drawing on a systematic literature review, conceptual as well as qualitative-empirical research approaches, this dissertation derives important contributions. Paper I describes the concept of “open foresight” as well as its defining elements and outlines how integrating external knowledge sources can enrich ‘established’ foresight. Paper II provides a typology of open foresight methods that are suitable for drawing on user knowledge and outlines their advantages, disadvantages and boundary conditions. Paper III offers an overview of the main findings from state-of-the-art research on the topic of business incubators and accelerators and identifies areas where further research is needed. Paper IV identifies distinct processes in different CVUs, shows how they enable strategic knowledge search, selection of strategically fitting ventures and subsequent strategic collaboration, and discusses how these functions help the CVU to fulfil its organizational charter in either a more exploitative or a more explorative mode.

Zusammenfassung der Dissertation

Ausgangspunkt dieser kumulativen Dissertation ist die Beobachtung, dass Organisationen heute in einer schnelllebigen und zunehmend komplexer und unsicherer werdenden Umwelt agieren. Ein Verständnis von Entwicklungen, die sie mittel- bis langfristig beeinflussen können, ist daher essentiell, um "strategisch vorbereitet" zu sein. Open Foresight ist ein geeigneter Ansatz, um mit Hilfe externer Wissensquellen, mögliche Zukunftsszenarien zu erkunden. Über das Verständnis schwacher Signale und künftiger Trends hinaus sollte Open Foresight auch zu Handlungsempfehlungen und entsprechenden Reaktionen, wie z.B. der Initialisierung von Innovationsprojekten, führen.

Etablierten Unternehmen fällt es allerdings häufig schwer, insbesondere radikale Innovationen voranzutreiben. Schon seit langem nutzen sie daher Corporate Venturing Einheiten (CVUs), um interne Innovationen auszubrüten oder externe Startups durch finanzielle Investments zu unterstützen. Viele der CVUs, die in den letzten Jahren gegründet wurden, weisen jedoch eine stärkere externe und strategische Ausrichtung auf. So setzen etablierte Unternehmen neuerdings auf Inkubatoren und Acceleratoren, um externe Startups zu unterstützen, während sie gleichzeitig mit ihnen zusammenarbeiten und von ihrer Innovationskraft profitieren. Andere etablierte Unternehmen hingegen haben Company Builder gegründet, die eigene Ideen generieren, validieren und implementieren, aber ebenfalls sehr extern orientiert sind, indem sie mit diversen Akteuren im Startup Ökosystem interagieren.

Diese Themen sind noch weitestgehend unerforscht und einige der offenen Fragen werden im Rahmen dieser kumulativen Dissertation untersucht. Die vier Artikel bauen dabei teilweise aufeinander auf und ergänzen sich inhaltlich. Das Ziel der Dissertation ist somit eine umfassende Antwort auf die Leitfrage, die sich durch alle Artikel zieht, zu geben: Wie nutzen

Organisationen Open Foresight und Business Inkubation als strategische Mittel, um Trends zu erkunden und Innovation zu fördern?

Auf Basis einer systematischen Analyse der Literatur sowie konzeptionellen und qualitativ-empirischen Forschungsansätzen, entwickelt diese Dissertation wichtige Erkenntnisse. Artikel I untersucht wie externe Wissensquellen das "etablierte" Foresight bereichern können und beschreibt das Konzept Open Foresight sowie dessen definierende Elemente. Artikel II typologisiert Open Foresight Methoden, mittels derer man Nutzer-Wissen erschließen kann und umreißt die jeweiligen Vor- und Nachteile sowie Rahmenbedingungen. Artikel III bietet einen Überblick über den Stand der Forschung zum Thema Inkubatoren und Acceleratoren und identifiziert Felder für weitere Forschung. Artikel IV zeigt wie Prozesse in CVUs die strategische Wissenssuche, Auswahl strategisch "passender" Ventures und anschließend strategische Kollaboration ermöglichen und diskutiert wie die CVU diese Funktionen in einer explorativen oder exploitativen Weise erfüllen.

Synopsis

1 Introduction

The starting point of this cumulative dissertation is the observation that, nowadays, organizations find themselves in a fast-paced and increasingly complex and uncertain environment. One important driver is digitization, which changed the nature and hence the rules of the game in many industries (Nambisan et al., 2017). As a consequence, many established companies fear that path-breaking innovations could disrupt their market and replace their own products and services (Christensen, 1997). Moreover, the increased speed of technological change, changing consumer preferences, as well as changes in the social and political sphere may lead to far-reaching implications for firms.

Thus, for organizations that want to succeed in such a challenging environment, future-oriented thinking becomes ever more important. By developing an understanding of weak signals, trends and developments that may affect them in the medium to long run, they can build up "strategic preparedness" and avoid discontinuities coming to them as a dangerous surprise (Ansoff, 1975). Hence, sensing and seizing future developments represents a core activity of corporate business (Teece, 2007). Ultimately, organizations that keep a good vision on what is happening at their periphery, can gain tremendous advantage over rivals (Day & Schoemaker, 2005).

Corporate foresight represents a promising and well-established approach for organizations to explore their environment in order to identify social, political, economic, ecological, and technological trends. On this basis, organizations can recognize emerging opportunities as well as possible threats early on. However, foresight includes not only collecting information on possible developments of strategic importance and developing a holistic understanding

thereof, but also deriving implications for action (Horton, 1999). Thus, only when foresight insights lead to action to bring about positive change to the organization, its value can be fully exploited (Rohrbeck, 2012; Thom, 2010). In particular, foresight can be an essential tool for innovation and strategic management by helping (1) discover new customer needs, technologies, and product concepts, (2) facilitate strategic guidance, and (3) challenge assumptions and spot disruptions (Rohrbeck & Gemünden, 2011). Based on these three identified roles, foresight can enhance a firm's innovation capacity and lead to the initialization of innovation projects.

Foresight has evolved significantly over time (Rohrbeck et al., 2015; Reger, 2001) and, recently, the term "open foresight" has been used to refer to the 'next wave' of corporate foresight (Daheim & Uerz, 2006; 2008). It means that the process is opened in order to utilize the firm's outside world (Mietzner, 2009). In fact, existing research on open and user innovation (e.g. von Hippel, 1986; Chesbrough, 2003; West & Bogers, 2014) has highlighted that the advent of the Internet and new communication and collaboration mechanisms has created many new possibilities for firms to tap into knowledge from beyond their organizational boundaries. Some of these methods and knowledge sources have significant application potential to enrich 'established' foresight, but research has not yet fully benefitted from these findings.

In order to remain viable in the future, organizations must recognize and act upon opportunities through innovation. Firms face the dual of exploiting current competitive advantages in the short run, while making provisions for more radical innovations in the long run (March, 1991). However, firms often encounter difficulties in fostering radical innovation, for instance, due to organizational inertia or conflicting organizational norms and structures (Hannan & Freeman, 1984; Henderson, 2006; Henderson & Clark, 1990). As one approach to address this situation, incumbents have long used Corporate Venturing Units (CVU) (Basu et

al., 2016; Hill & Birkinshaw, 2014), which often focused on either hatching internal innovations (Burgelman, 1983; Mian et al., 2016) or supporting external startups through financial investments (Miles & Covin, 2002). Yet, it seems that a new wave of CVUs with a stronger external and strategic orientation is emerging. Some of these CVUs build on the adoption of venture support organizations, namely incubators and accelerators, which were previously used as tools to promote economic development and university technology transfer or were run by independent, profit-oriented firms (von Zedtwitz, 2003). By establishing corporate incubators and accelerators, established firms seek to support external startups, while entering in exchange and collaborating with these in order to benefit from their innovativeness (Weiblen & Chesbrough, 2015; Kohler, 2016). Moreover, some incumbent companies founded another type of CVU: Company builders focus on generating, validating and implementing their own internal ideas and seek to exit mature ventures through IPOs or integrate these in their corporate parent as new business units or subsidiaries (Kuckertz, 2017; Scheuplein, 2017). Although company builders do not directly support external ventures, they are also very externally oriented, as they interact and partner with startups and other actors in the ecosystem during ideation, e.g. to receive feedback. CVUs are an interesting research object in the context of foresight, because having a deep understanding of emerging developments and technologies is essential for their work.

A long and rich research tradition exists regarding the phenomenon of business incubators since this kind of venture support institution emerged in the late and early 1960s (Lewis, 2001; Campbell & Allen, 1987). Over the past two decades, the phenomenon of accelerators as a particular form of incubators also gained traction (Cohen, 2013; Cohen & Hochberg, 2014). However, as incubators and accelerators are a relatively new phenomenon in the context of corporate venturing, only a few published articles focus on corporate incubators (Becker & Gassmann, 2006; Branstad, 2010; Ford et al., 2010) or corporate accelerators

(Kohler, 2016; Jackson, & Richter, 2017). The literature on new forms of internal CVUs, like company builders, is equally nascent (Kuckertz, 2017; Scheuplein, 2017).

Research on the outlined topics is still in an early stage and some open questions will be investigated in this cumulative dissertation. To this end, all four papers address the overarching question of how organizations use open foresight and business incubation as strategic means to explore trends and promote innovation. The dissertation title uses the metaphor of speedboats and refers in particular to the core paper of the dissertation, Paper IV. CVUs can thus be understood as vehicles going ahead of a slow tank ship in an agile and fast way and not shying away from risk in order to explore uncertain territory and discover what lies ahead of the future route.

The papers partly build on one another and complement each other content-wise: on the one hand, foresight can enhance a firm's innovation capacity and lead to the initialization of innovation projects. On the other hand, engaging into innovative activities in the context of business incubation requires a good understanding of emerging developments and technologies. Paper I outlines how integrating external knowledge sources can enrich 'established' foresight and describes the concept of "open foresight" as well as its defining elements. Paper II builds on Paper I and explains why users can be a valuable knowledge source in the context of open foresight, and outlines advantages, disadvantages and boundary conditions of methods that are suitable for tapping user knowledge. Paper III gives an overview of the start-of-the-art research on business incubators and accelerators. It identifies some areas where further research is needed, and some of these research gaps will be addressed in Paper IV. Paper IV identifies processes in recent established CVUs, including corporate incubators, accelerators, and company builders, and investigates how they relate to corporate innovation strategy.

Drawing on a systematic, co-citation analysis-based literature review, conceptual as well as qualitative-empirical research approaches, this dissertation derives important contributions to the research areas of foresight, open innovation and entrepreneurship, which are relevant for both theory and practice.

This introductory chapter to the four dissertation papers is structured as follows: The following section outlines the theoretical background of this dissertation. Section 3 describes gaps in the literature and outlines the research questions addressed in the four papers of the cumulative dissertation. Section 4 describes the methodologies, which were used to answer the research questions, and explains why they were used. In section 5, summaries of the individual papers are provided. Section 6 highlights the central contributions and describes their relevance for both theory and practice. Finally, section 7 concludes with an outlook on directions for future research.

2 Theoretical Background

The research conducted in this dissertation mainly builds on corporate foresight, open innovation as well as entrepreneurship research streams. This chapter summarizes core statements from these literatures.

Paper I and Paper II build on corporate foresight and open and user innovation literature. By bringing together these previously disparate research streams, the concept of "open foresight" is elaborated in Paper I. Paper II then reviews possible methods, which are suitable for integrating users as knowledge source. These include methods, which are known from both open and user innovation literature and from traditional corporate foresight literature, can now be applied in more open ways.

Papers III and IV pick up on entrepreneurship literature, particularly research on incubators (and similar organizations) that support the growth of new businesses. Paper III provides a co-citation analysis-based, systematic literature review of research on incubators and accelerators. Paper IV focuses rather on corporate entrepreneurship by investigating the phenomenon that in recent years an increasing number of incumbent companies founded corporate venturing units such as corporate incubators, accelerators and company builders.

2.1 Literature on (Open) Foresight

Today's world is highly dynamic and companies, in order to ensure their survival, need to be able to detect and react to changes early (Nelson & Winter, 1982). Corporate foresight research builds on the notion that most events and developments do not come as a surprise to a company, but that weak signals often foreshadow their occurrence. By exploring such vague information and proactively addressing future developments, companies can build up "before-the-fact strategic preparedness" (Ansoff, 1975; p. 22), respond earlier and have their responses better planned and executed.

Corporate foresight involves gathering information about possible medium- and long-term events and developments of strategic importance, and then forming a holistic understanding of potential environmental changes and implications thereof (Horton, 1999). The generated insights should then culminate into organizational action as to bring about (positive) change to the organization, because only then can the value of corporate foresight be fully exploited (Rohrbeck, 2012; Thom, 2010). In that sense, corporate foresight is essentially characterized as an action-oriented approach: instead of understanding the future as an 'inevitable destiny', every firm can – within its own range of influence – shape the future pro-actively instead of trying to adapt to unforeseeable futures (Barker & Smith, 1995).

Rohrbeck and Gemünden (2011) investigated how corporate foresight can create value by enhancing a firm's innovation capacity. Their study identified three roles that foresight can play:

- *Initiator role*. Corporate foresight can help to discover new customer needs, technologies, and product concepts and may thus lead to new innovation initiatives being launched.
- *Strategist role*. Corporate foresight facilitates strategic guidance and helps to develop a vision, consolidate opinions, assess and reposition innovation portfolios and identify new business models.
- *Opponent role*. Corporate foresight provokes a challenge to existing assumptions and ongoing innovation projects and can help to spot disruptions.

Numerous methods are suitable for conducting foresight (see Popper, 2008 for a list of methods). However, there is no universal methodology or satisfactory 'off the shelf' solution, and the selection of foresight methods will differ according to the specific goals and needs of the company (Slaughter, 2002; Magruk, 2011). In addition, the way corporate foresight was conducted in the beginning, has evolved significantly over time (Rohrbeck et al., 2015; Reger, 2001). When the research field emerged in the 1950s, corporate foresight was a rather isolated task within the organization that aimed at quantitatively analyzing the past in order to be able to predict the future (Burmeister & Schulz-Montag, 2009). However, in the 1960s and 1970s, foresight practitioners recognized that the future could be neither calculated nor foreseen. Instead, they increased the application of qualitative methods, which rely on expert knowledge to develop alternative scenarios in order to explore different possible futures (Bradfield et al., 2005; Rohrbeck et al., 2015). The scope of corporate foresight widened more and more. Environmental scanning established as a continuous process and increasingly considered political and social developments, replacing the previous focus that had been

limited to market and technology developments (Bradfield et al., 2005; Rohrbeck et al., 2015). Since the 2000s, foresight consulted/integrated diverse stakeholders from all parts of the organization, using interactive and exploratory methods. As a result, corporate foresight is nowadays understood as an organizational ability that is institutionalized and developed within the organization to create a future discourse (Slaughter, 1999; Tsoukas & Shepherd, 2004).

Nevertheless, foresight is still evolving in theory and practice. In recent years, the concept of "open foresight" has been introduced and has so far only appeared in few publications. Daheim and Uerz (2006, 2008) first coined the term when pointing to the 'next wave' of corporate foresight, which is "based on the assumption that businesses can shape future contexts and markets by anticipating through an open dialogue the dynamic interaction between social, technological and economic forces" (Daheim & Uerz, 2008, p. 332). Mietzner (2009) juxtaposes the terms closed and open foresight: Closed foresight refers to activities, which happen within the firm, whereas open foresight refers to the opening of the process to utilize the firm's outside world. Miemis et al. (2012) refers to open foresight as a "process for analyzing complex issues in an open and collaborative way, and to raise the bar on public discourse and forward-focused critical thinking" (p. 92). In addition, the concept has been mentioned in four rather practice-oriented articles (Rau et al., 2014; Gattringer & Strehl, 2014a, 2014b; Rudzinski & Uerz, 2014).

2.2 Literature on Open and User Innovation

Companies face pressure to innovate ever more rapidly. At the same time, the closed innovation paradigm is losing its relevance, i.e. companies will find it difficult to rely only on knowledge, which is generated internally. This is due to erosion factors that include the increased mobility of skilled workers, more capable universities, globalization of knowledge,

expansion of venture capital, as well as the rise of Internet and information and communication technologies (Chesbrough, 2003). In particular, the latter have contributed to reducing the costs of communication and have enabled new forms of collaboration, which allow geographically dispersed people to participate and contribute their knowledge to the innovation process (West & Bogers, 2014). This development is reflected in research, which over the past decade generated many articles in the open innovation research domain.

This literature strand on open innovation builds and strongly overlaps with research on user innovation, as pioneered by Eric von Hippel and others. The term 'open innovation' itself was coined by Chesbrough (2003) and describes the insight that firms benefit from opening their innovation processes towards external actors and sources of innovation. These, for instance, include (lead) users, buyers, suppliers, business partners, research institutions, startups, or members in (online) communities or crowds (Koput, 1997; von Hippel, 1986). Thus, Chesbrough (2003, p. 43) proposes the following definition:

> *"Open Innovation means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well. The approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths."*

A revised definition, which appeared several years later, stresses the intentionality of the knowledge flows into and out of the firm (Chesbrough, 2006, p. 1). The definition further evolved and Chesbrough and Bogers (2014) extended the understanding of the concept by saying that open innovation involves the use of both pecuniary and non-pecuniary mechanisms in line with the organization's business model. In general, three archetypes of open innovation processes can be distinguished: outside-in, inside-out and coupled innovation (Gassmann & Enkel, 2004). The focus of this dissertation lies on outside-in open innovation processes, which involves the integration of external knowledge into the innovation process.

Open innovation is an umbrella term for many different mechanisms (Stanko et al., 2017). This dissertation focuses on those open innovation methods, which seek to tap knowledge of lead users, online communities as well as crowds.

Users can be a valuable knowledge source, because they possess superior need-related knowledge, which helps companies gain a better understanding of their target markets as a basis for new product development. Integrating their knowledge fosters a higher commercial market attractiveness (Franke et al., 2006) of their products. Research has highlighted the special role of lead users differing from typical users, who are hindered by their present real-world experiences and find it difficult to imagine new attributes or new options for use of a new product (von Hippel, 1986; Herstatt & von Hippel, 1992). Lead users, in contrast, "are familiar with conditions which lie in the future for most - and so are in the position to provide accurate data on needs related to such future conditions" (von Hippel, 1986, p. 796). Moreover, as they are dissatisfied with the current market offering and would highly benefit from a new solution to their needs, they are likely to innovate themselves or contribute to the development of new products (Urban & von Hippel, 1988; von Hippel, 1988; Morrison et al., 2000; 2004; Franke & Shah, 2003). Incorporating lead users into the fuzzy front end of the innovation can be achieved through the lead user method, where lead users are identified and invited to workshops where they discuss and collaboratively develop new product concepts together with company employees (Herstatt & von Hippel, 1992; Lüthje & Herstatt, 2004).

Communities refer to voluntary associations where users discuss topics of common interest, whereas much information is usable, accessible and valuable for companies (Füller et al., 2006). For instance, users articulate their general satisfaction and complaints, report bugs and problems or share ideas for improvements and novel products and features. Firms can unobtrusively analyze relevant dialogue using a netnographic approach (Kozinets, 1998; 2002) or get directly involved through sponsoring existing or creating own communities, then

joining the conversation and ask questions in order to brainstorm and stimulate dialogue around topics of interest (West & Lakhani, 2008). In this respect, communities can be a rich source of information for innovation and new product development.

Crowdsourcing refers to the outsourcing of a task, which was traditionally performed by a designated agent (usually an employee), to an undefined, generally large group of people by way of an open call (Howe, 2006). After the problem has been broadcasted, crowd members self-select to solve the problem and submit their ideas and suggestions for improvement or concrete solutions. Afuah and Tucci (2013) distinguish between collaboration and tournament-based forms of crowdsourcing. Collaboration-based crowdsourcing describes the joint work of many heterogeneous individuals towards a shared solution. Examples include many projects in open source software development (Lakhani & von Hippel, 2003; von Krogh et al., 2003; Belonzon & Schankermann, 2012) or Wikipedia, where a crowd of volunteers collaborates, interacts and assists each other to build the world's largest online encyclopedia (Tapscott & Williams, 2006). Another type of crowdsourcing is tournament-based, where many heterogeneous individuals work on a task or problem and compete for the best solution, which is then rewarded with a price. Examples include innovation contests to let a large crowd of users brainstorm for ideas (Bayus, 2013) or web-based platforms such as Innocentive, where firms engage in broadcast search among experts (Jeppesen & Lakhani, 2008).

2.3 Literature on Business Incubating Organizations

Incubators are organizations that aim to support new ventures based on a broad range of measures. Their activities can have positive effects, for instance, on firm growth (Stokan et al., 2015) and with regard to higher levels of post-incubation performance among graduated firms (Lasrado et al., 2006). Compared to a control sample of off-incubator firms, incubatees

differ only marginally in terms of input and output measures of innovative activity, but they have on board entrepreneurs with better human capital, show higher growth rates, and find it easier to get access to public subsidies (Colombo & Delmastro, 2002). In addition, firms in an incubator perform better in terms of adoption of advanced technologies, suitability for participating in international R&D programs, and establishment of collaborative arrangements (Colombo & Delmastro, 2002). Moreover, incubator activities can make an impact on the macroeconomic level: Two studies (Markley & McNamara, 1995; Sherman & Chappell, 1998) found that employment and income multiplier effects occur, since economic activities of incubated firms have indirect impact on other companies in the region. All these potential impacts highlight that incubating organizations are an important part of the entrepreneurial ecosystem.

The first incubators emerged in the late 1950s and early 1960s (Lewis, 2001; Campbell & Allen, 1987). Since then, the incubator landscape has evolved significantly. While the traditional focus of incubators was on promoting regional development and university technology transfer, many independent profit-oriented incubators took up operations from the 1990s onwards (Hackett & Dilts, 2004). Finally, we observe that in recent years an increasing number of established companies have set up private corporate incubators as a means to reach out to young ventures as innovation partners (Weiblen & Chesbrough, 2015; Kohler, 2016). In addition, over the past two decades, the phenomenon of accelerators as a particular form of incubators has gained traction in both entrepreneurship theory and practice (Cohen, 2013; Cohen & Hochberg, 2014). In consequence of this evolution, heterogeneity of incubation is evidenced in different institutional missions and business models of different sponsors. Some typologies (e.g. Kuratko & LaFollette, 1987; von Zedtwitz, 2003) clarify the characteristics of different incubators.

Along with the evolution of the incubator industry, the forking of its development paths and experimentation with new business models, a plethora of different definitions have emerged. However, as the incubator concept was adapted to different needs, developing a universal definition proved more difficult (Kuratko & LaFollette, 1987). While, for a long time, the physical co-location of incubatees has constituted a central defining characteristic of incubators, this feature often lacks in the more recent definitions due to the increasing focus on counseling and support services and the advent of virtual business incubators (e.g. Rice, 2002; Bergek & Norrman, 2008). The newer breed of incubators, especially privately owned incubators, put stronger emphasis on the provision of direct access to capital and specialized services in order to speed up the startups' time-to-market and include start-ups in a common network with technological and commercial big players (Grimaldi & Grandi, 2005).

Core activities in incubators involve selecting incubatees, providing infrastructure, business support as well as mediation, and, finally, preparing incubatees for graduation (Bergek & Norrman, 2008). Maintaining a steady flow of applications is a key success factor (Patton et al., 2009). To screen and filter ventures, incubators apply different selection strategies (Bergek & Norrman, 2008) as well as selection criteria (Lumpkin & Ireland 1988; Aerts et al. 2007). After moving in, incubators engage in frequent counseling interactions as to monitor incubatees' performance and provide them with business support where needed (Scillitoe & Chakrabati, 2010; Rice, 2002). Whenever a venture team needs more specialized, in-depth expertise, which they cannot provide themselves, the incubator team assists through networking activities (Scillitoe & Chakrabati, 2010). This includes bringing together the ventures with actors within the internal and external environment (Weinberg et al., 1991). Promoting interactions in the internal networks is particularly important to create synergies among resident businesses (Rothschild & Darr, 2005).

2.4. Incubators, Accelerators and Company Builders as Means of Corporate Venturing

In recent years, many incumbent companies have founded or sponsored incubators, accelerators and company builders. This development relates to the situation of many incumbent firms, where, due to increasing environmental uncertainty and the threat of disruption (Christensen, 1997), they need to innovate ever more rapidly. They have to tackle the dual challenge of exploiting current competitive advantages in the short run, while making provisions for more radical innovations in the long run (March, 1991). However, the latter proves particularly difficult because of organizational inertia or conflicting organizational norms and structures (Hannan & Freeman, 1984; Tushman & O'Reilly, 1996).

As one approach to address this situation, incumbents have long used Corporate Venturing Units (CVU) (Basu et al., 2016; Hill & Birkinshaw, 2014). Most of this research focused on hatching internal innovations (Burgelman, 1983; Mian et al., 2016). External corporate venturing can be achieved through partnerships with startups (Miles & Covin, 2002), but literature has focused on the investment aspect while neglecting possible strategic benefits. However, in recent years, an increasing number of established companies has sought to leverage external ventures in a more cooperative way (Becker & Gassmann, 2006). To this end, corporate incubators and accelerators were founded with the aim to support startups while benefitting from their innovativeness (Kohler, 2016; Weiblen & Chesbrough, 2015). This is a relatively new phenomenon in the context of corporate venturing and, so far, only a few studies on corporate incubators have been published (Becker & Gassmann, 2006; Branstad, 2010; Ford et al., 2010). Accelerators, in general, have received some attention because of their newness (Cohen, 2013; Cohen & Hochberg, 2014; Dempwolf et al., 2014; Hochberg, 2016; Pauwels et al., 2016), but few articles focused explicitly on corporate accelerators (Kohler, 2016; Jackson, & Richter, 2017). Moreover, several incumbent companies have recently also founded company builders, which are another type of internal

CVU. They develop their own internal ideas and seek to exit these new ventures through IPOs once they are sufficiently mature (Kuckertz, 2017; Scheuplein, 2017).

3 Research Agenda

The review of literature in the previous chapter has demonstrated that, in recent years, scholars have made significant contributions in the areas of corporate foresight, open innovation and entrepreneurship. However, there are still major gaps in the literature that research has not sufficiently addressed yet. This chapter outlines some of these open questions, which are addressed in this cumulative dissertation.

Existing research on open and user innovation has highlighted that the advent of the Internet and new communication and collaboration mechanisms has created many new opportunities for firms to tap knowledge from distributed external sources. Some of these methods have significant application potential for corporate foresight as they enable firms to extend search for future-related knowledge beyond their organizational boundaries. Nevertheless, corporate foresight research has not yet fully benefitted from these findings. This is an unsatisfactory situation, which calls for further research. In detail, a stronger linkage should be established between the two previously disparate research fields by systematically exploring how firms' foresight practice can benefit from integrating methods and knowledge sources from the open and user innovation literature.

The concept of "open foresight" has already appeared in previous literature. However, in these few existing articles the notion of openness is associated with several different aspects, such as open innovation, open access, open participatory structure, open dialogue, open process, or open thematic perspective. Overall, the descriptions of the authors' understanding of open foresight are rather terse and remain sketchy. Thus, a clear and unified definition of the term and of what openness expresses is still lacking. Therefore, ***Paper I*** seeks to address

this research gap. The overall aim of this paper is to review and integrate insights from open and user innovation literature and answer the following research question:

- ⇨ *RQ1: How can the concept of foresight be advanced towards a more 'open' understanding in order to systematically benefit from external knowledge sources?*

While Paper I lays a conceptual foundation for the term open foresight and describes firms' benefits of opening up the foresight towards different external knowledge sources, deeper investigation requires identification and assessment of appropriate methods. Open and user innovation literature has provided insight into how different external actors and sources provide valuable knowledge to the innovation process. Qualified sources, for instance, include (lead) users, buyers, suppliers, business partners, research institutions, startups, or members in (online) communities or crowds (Koput, 1997; von Hippel, 1986). ***Paper II*** picks up on this need for further investigation of methods that can be applied to corporate foresight. Since open and user innovation literature is an umbrella term, which encompasses many different approaches, trying to evaluate "all" methods would be unrealistic and is clearly beyond the scope of one single article. Paper II therefore focuses only on methods that rely on knowledge of users and user collectives. The aim of this paper is to not only give an overview of possible methods, but also illustrate why users are a qualified source of knowledge for foresight and highlight how their integration can potentially enhance foresight results. In the context of the first research question, Paper II seeks to describe suitable methods:

- ⇨ *RQ 2.1: Which methods are suitable for sourcing user knowledge for foresight?*

Previous literature has stressed that there is no universal methodology or 'off-the-shelf' approach and that method selection depends on the firm's individual goals (Slaughter, 2002; Magruk, 2011). This is true also for the described methods. Therefore, Paper II addresses the following research question:

- ⇨ *RQ 2.2: What are the advantages, disadvantages and boundary conditions of these methods?*

The subsequent ***Papers III and IV*** shift the focus towards business incubators and similar types of organizations that support young businesses. In particular, activities of corporate venturing units, such as corporate incubators, accelerators and company builders, can serve the purpose of open foresight by monitoring the startup ecosystem in order to understand future developments in their respective industry and identify potential opportunities (e.g. startups as possible incubatees and partners) and threats (e.g. disrupting technologies). By then exchanging and partnering with startups in various ways, established companies seek to strengthen their own innovative capacity.

As described in the previous chapter, the phenomenon of incubators has existed and been studied since the late 1950s and early 1960s. Over time, the incubator landscape has evolved and the heterogeneity of incubator types increased. As business incubators and accelerators have aroused increasing research interest, a few review studies have already been published (Albort-Morant & Ribeiro-Soriano, 2016; Hackett & Dilts, 2004; Phan et al. 2005; McAdam et al. 2006; Mian et al. 2016). However, some of these articles date at least a dozen years back and do therefore not cover the latest developments in this dynamically evolving field. The other studies are limited to bibliometric analyses, where metrics provide only a superficial overview. Therefore, an in-depth-review is missing, which identifies the most relevant fields and topics in the literature and systemically analyses latest findings as well as newly emerging trends. The research question addressed in ***Paper II*** therefore is as follows:

- ⇨ *RQ 3: What are the main findings from the state-of-the-art research on business incubators?*

While summarizing core results from previous literature, Paper III also identifies themes that require further investigation. In particular, the phenomenon of corporate incubation has

gained traction in practice in recent years, but has so far only received limited attention from academic scholars. ***Papers IV*** answers the resultant call for research on this topic.

Incumbent companies, which are facing pressure to innovate ever more rapidly, have increasingly reached out to startups as external sources of knowledge and innovation partners. Hence, they founded or sponsored corporate incubators, accelerators or company builders as platforms for exchange that may help build bridges between the corporate and startup world and facilitate collaboration. As described in the previous chapter, research on these recent types of corporate venturing units (CVUs) has so far been limited. In particular, no previous research has focused on the processes of these newer types. Thus, in ***Paper IV***, in a first step we seek to answer the following research question:

- ⇨ *RQ 4.1: What processes are taking place in the context of interactions between the core stakeholders, i.e. the incumbent company, the CVU and the ventures?*

These processes in some ways help the CVU to fulfil its organizational charter. Thus, in a second step, we investigate how the identified processes relate to corporate innovation strategy and help the established company become more innovative. Accordingly, the second research question in Paper IV is as follows:

- ⇨ *RQ 4.2: How do the identified processes contribute to corporate innovation strategy?*

4 Methodology

As illustrated in the previous chapter, the current literature leaves open some important research questions. This cumulative dissertation seeks to address the outlined research questions and applies a systematic, co-citation analysis-based literature review as well as conceptual and qualitative-empirical research approaches. The rationale for selecting these methodologies and the way we used them to tackle the research questions will be explained in

greater depth in this chapter. The following table gives an overview of the research questions and methodologies applied in the four papers of this dissertation.

Paper I of this dissertation is conceptual in nature and seeks to derive an advanced understanding of the concept of "open foresight". To this end, the paper synthesizes findings and seeks to create a stronger linkage between the two previously disparate research strands of corporate foresight and open innovation. On this basis, Paper I gives an overview of the status of research and shows how corporate foresight might benefit from a more 'open' understanding. We identify individual elements, which are crucial for this understanding, and, by building on these, we finally provide a definition of the construct of open foresight.

Paper	Research Question(s)	Method
I	RQ1: How can the concept of foresight be advanced towards a more 'open' understanding in order to systematically benefit from external knowledge sources?	Conceptual
II	RQ 2.1: Which methods are suitable for sourcing user knowledge for foresight? RQ 2.2: What are the advantages, disadvantages and boundary conditions of these methods?	Conceptual
III	RQ 3.2: What are the main findings from the state-of-the-art research on business incubators?	Systematic co-citation analysis-based literature review
IV	RQ 4.1: What processes are taking place in the context of interactions between the core stakeholders, i.e. the incumbent company, the CVU and the ventures? RQ 4.2: How do the identified processes contribute to corporate innovation strategy?	Qualitative, empirical

Overview of Research Questions and Methodological Approaches (source: own illustration)

Paper II further elaborates on Paper I, also using a conceptual approach. Similarly, the paper builds on a synthesis of previous insights from foresight as well as open and user innovation literature and aims to explore possibilities of integrating knowledge from (lead) users and user collectives (such as communities and crowds) into foresight activities. In a first step, Paper I explains where users have an edge in knowledge and how integration of such knowledge can help firms enhance their foresight results. Then, the paper reviews and gives an overview of

suitable methods known from both open and user innovation and 'traditional' foresight, which can be conducted in a significantly more open way or incorporate elements from open innovation. Finally, these methods are juxtaposed along key dimensions and discussed with regard to their advantages, disadvantages and boundary conditions.

Paper III carries out a systematic literature review on the topic of business incubation. At first, we perform a bibliometric analysis in order to quantitatively investigate the body of literature of the research conducted in this field. We used selected search terms to scan the ISI Web of Science database, which is considered the most comprehensive database for scientific articles and has therefore been used for literature reviews (Albort-Morant & Ribeiro-Soriano, 2016; Dahlander & Gann, 2010; Mian et al., 2016). The returned results were further filtered, e.g. only for articles that appeared in journals in the management science area. Based on this final sample of relevant articles, we created tables to provide overviews of research by country, the most cited authors and the most cited keywords.

In a second step, the paper uses a co-citation analysis to identify clusters as well as the most central articles in these clusters. Clusters are groups of articles that share many citations and are therefore likely to treat a topic from a similar perspective using similar language and way of thinking (Boyack & Klavans, 2010). After filtering for duplicates and entries with only one citation, the results of the co-citation analysis are visualized in a co-citation network graph.

Based on the results of the bibliometric and co-citation-analysis, Paper III then provides an overview of the state-of-the-art research on business incubation and summarizes the main findings from the literature.

Paper IV is based on a qualitative-empirical *research design* (Eisenhardt & Graebner, 2007), which generally aims at exploring 'how' and 'why' questions. Thus, given our interest in analyzing processes and developing a theory of how they relate to corporate innovation strategy, we applied a grounded theory approach (Corbin & Strauss, 1990; Glaser & Strauss,

1967). Instead of focusing on a single "one-shot case study" (Campbell, 1975), we applied a multi-case study design (Yin, 1993). The observation units were corporate venturing units, with each unit being one case (Miles & Huberman, 1994).

Our *sampling strategy* focused on CVUs, which were set up within six years prior to the interview. We sampled CVUs where at least one corporation financed or sponsored its operations and has a considerable stake in the CVU's activities. Furthermore, we aimed at increasing the variance (Miles & Huberman, 1994) through the inclusion of CVUs in different industries and of CVUs founded by both multinational as well as medium-sized companies. We also aimed at sampling CVUs that are active in different countries. However, we had budgetary restrictions and, as we preferred to visit the CVUs for face-to-face interviews to get a better impression of their work context, we had to conduct most of our interviews in Germany.

For our *data collection*, we conducted semi-structured interviews with decision makers in 13 different CVUs in the period between June 2016 and February 2018. With the prior consent of the interviewees, we recorded and transcribed the interviews, which on average lasted about 75 minutes, resulting in 346 pages of transcription (see confidential Appendix for interview transcripts). Using an interview guideline, we asked questions to guide the conversation and allowed interviewees to answer openly. This helped us discover new aspects that we had not considered before. After each interview, we reviewed our interview guideline and adjusted it accordingly, if necessary. Finally, we terminated our data collection when we noticed that a point of theoretical saturation was reached and further inputs did not generate new insights into the emerging theory (Glaser & Strauss, 1967). For the purpose of triangulation, we used further documents such as field notes, presentation slides, press releases, information from the CVU websites, as well as relevant articles in public media.

The *data analysis* followed suggestions from the literature (Eisenhardt & Graebner, 2007). We used a qualitative coding approach, as described in Gioia et al. (2012) and used in previous studies on similar topics (Basu et al., 2016). To support the process of data analysis, we used the MAXQDA software, which helped us organize, develop and refine our emerging codes and constructs. First, we applied in-vivo and descriptive codes to label relevant quotes in the transcripts that dealt with different interactions between the CVU, the corporate parent as well as the ventures. In total, we applied 1327 codes. In a second step, we related these codes to each other, which then formed the basis for first-level categories. We identified 24 first-level categories, which, in a third step were aggregated into 7 second-order concepts.

5 Summary of Papers

Paper I: *Open Foresight: Exploiting Information from External Sources*

The starting point of the first paper of this dissertation is the observation that, nowadays, organizations find themselves in a fast-paced and increasingly complex and uncertain environment. Thus, Paper I highlights the importance of future-oriented thinking in order to understand weak signals, trends and developments that may affect the firm in the medium to long run. Thereby, they can build up "strategic preparedness" and avoid discontinuities coming to them as a dangerous surprise (Ansoff, 1975).

Corporate foresight is an approach for organizations to explore their environment and thus, recognize emerging opportunities as well as possible threats early on. It includes not only collecting information on possible developments of strategic importance and developing a holistic understanding thereof, but also deriving implications for action and triggering appropriate organizational responses (Horton, 1999; Rohrbeck, 2012; Thom, 2010; Rohrbeck et al., 2015). Foresight theory and practice has evolved significantly over time (Rohrbeck et al., 2015; Reger, 2001). Recently, the term “open foresight” has been introduced (Daheim &

Uerz, 2006; 2008), meaning that the process is opened in order to utilize the firm's outside world (Mietzner, 2009). In fact, existing research on open and user innovation (e.g. von Hippel, 1986; Chesbrough, 2003; West & Bogers, 2014) has described many methods for firms to tap into knowledge from beyond their organizational boundaries. Some of these methods and knowledge sources have potential to enrich 'established' foresight, but research has not yet fully benefitted from these findings. This unsatisfactory situation was the motivation for Paper I.

Using a conceptual approach, Paper I explores how the concept of foresight can be advanced towards a more 'open' understanding in order to systematically benefit from integrating methods and knowledge sources from the open and user innovation literature. To this end, Paper I first reviews foresight literature. Then the paper proceeds by synthesizing findings from the two previously disparate research strands. On this basis, Paper I explains connotations of the concept and identifies three individual elements, which shape its understanding. Based on these elements, the main theoretical contribution of Paper I lies in advancing foresight and developing a clarified and more 'open' understanding. Accordingly, we understand open foresight as the systematic use of distributed information sources in order to anticipate the future corporate business environment and support an organization's strategic decision making. It is institutionalized within the organization and often conducted interactively with outside actors. Open foresight draws especially on insights and methods gained from the open innovation research.

Paper II: *Opening up Corporate Foresight: What Can We Learn from Open and User Innovation?*

While Paper I laid a conceptual foundation for the term open foresight and described firms' benefits of opening up the foresight towards different external knowledge sources, deeper

knowledge is required to identify and assess appropriate methods. Paper II of this dissertation picks up on this need for further investigation of methods. However, since open and user innovation literature is an umbrella term, which encompasses many different approaches, trying to evaluate "all" methods would be clearly beyond the scope of one single article. Thus, Paper II narrows its focus to methods that rely on knowledge of users and user collectives.

In the context of the first research question, Paper II seeks to identify methods, which are suitable for sourcing user knowledge for foresight. However, no universal methodology or 'off-the-shelf' approach exists and the selection of suitable methods always depends on the firm's specific objectives (Slaughter, 2002; Magruk, 2011). Therefore, Paper II seeks to answer the second research question: What are the advantages, disadvantages and boundary conditions of these methods?

Using a conceptual approach, the paper builds on a synthesis of previous findings from foresight as well as open and user innovation literature. In a first step, Paper II explains that users are a valuable source of knowledge, because they have an edge in knowledge regarding their needs (von Hippel, 1986, 1988). Moreover, involving users can potentially enhance foresight results, because incorporating diverse perspectives broadens the search space and minimizes the risk of overlooking harmful developments or missing opportunities (Jeppesen and Lakhani, 2008; Könnölä et al., 2007; Rau et al., 2014).

Then, the paper reviews and provides an overview of methods that are suitable for drawing on user knowledge. This includes methods from open and user innovation as well as methods from traditional foresight that can now be conducted in significantly more open ways. One of the main contributions of Paper II then lies in typologizing these methods. They rely on inviting lead users (e.g. workshops, Open Delphi), utilizing dialogue and data from online communities and social networks (e.g. netnography, big data analysis), or apply

crowdsourcing (e.g. “TrendWikis”, idea-spotting networks, prediction markets, collaborative forecasting games).

Finally, these methods are juxtaposed along key dimensions and discussed with regard to their advantages, disadvantages and boundary conditions. This part of the paper is also highly relevant to practitioners, who plan to integrate user knowledge into their foresight process and need guidance for selecting the method that is most appropriate for their purpose.

Paper III: *Business Incubators and Accelerators: A Co-Citation Analysis-Based, Systematic Literature Review*

Incubators are organizations that aim to support new ventures based on a broad range of measures. Their activities can have positive effects, not only on the performance of the individual firms (Stokan et al., 2015; Lasrado et al., 2006; Colombo & Delmastro, 2002), but also on a macroeconomic level (Markley & McNamara, 1995; Sherman & Chappell, 1998). Therefore, incubating organizations are an important part of the entrepreneurial ecosystem.

Incubators have existed and been studied since the late 1950s and early 1960s. Over time, the incubator landscape has evolved and the heterogeneity of incubator types increased, which can be evidenced in different institutional missions and business models of different sponsors. As the phenomenon of business incubators and accelerators has aroused increasing research interest, a few review studies have already been published (Albort-Morant & Ribeiro-Soriano, 2016; Hackett & Dilts, 2004; Phan et al., 2005; McAdam et al., 2006; Mian et al., 2016). However, they date at least a dozen years back and do therefore not cover the latest developments in this dynamically evolving field. The other studies are limited to bibliometric analyses, where metrics provide only a superficial overview. Therefore, a current in-depth-review is missing, which also covers latest findings as well as newly emerging trends. Thus,

Paper III addresses this literature gap and carries out a systematic literature review on the topic of business incubation.

Using the ISI Web of Science database, we first perform a bibliometric analysis in order to quantitatively investigate the body of literature of the research conducted in this field. The results are presented in tables and indicate research by country, the most cited authors and the most cited keywords. In a second step, the paper uses a co-citation analysis to identify clusters as well as the most central articles in these clusters. The results of the co-citation analysis are visualized in a co-citation network graph. Based on the results of the bibliometric and co-citation-analysis, Paper III then provides an overview of the state-of-the-art research on business incubation and summarizes the main findings from the literature with a focus on the more central papers. This part includes (1) studies on origins, definitions and typologies of incubators, (2) studies on the incubation process, and (3) studies on impact and performance. While summarizing this literature, we found that there is a significant level of confusion regarding terminology. To address this issue, Paper III reviews different existing definitions, discusses the advantages and disadvantages thereof, and finally derives a reconcilable definition of the concept of business incubators. Finally, as a result of the literature review, some research trends and new topics became evident. Thus, a further contribution of Paper III lies in highlighting areas where new research is needed and in outlining a research agenda accordingly.

Paper IV: *Speedboating into the Future: How the Recent Breed of Corporate Venturing Units Promotes Corporate Innovation Strategy*

Paper IV of this dissertation describes that incumbent companies, which are facing pressure to innovate ever more rapidly, have long used Corporate Venturing Units (CVU) (Basu et al., 2016; Hill & Birkinshaw, 2014), which often focused on either hatching internal innovations

(Burgelman, 1983; Mian et al., 2016) or supporting external startups through financial investments (Miles & Covin, 2002). Yet, it seems that CVUs, which have been established in recent years, have a stronger external and strategic orientation.

Corporate incubators and accelerators are a relatively new phenomenon in the context of corporate venturing. Some incumbent firms have established these CVUs to support external startups, while entering in exchange and collaboration with these in order to benefit from their innovativeness (Weiblen & Chesbrough, 2015; Kohler, 2016). Some other incumbent firms founded company builders, which focus on generating, validating and implementing their own internal ideas (Kuckertz, 2017; Scheuplein, 2017). Although company builders do not directly support external ventures, they are also very externally oriented, as they interact and partner with startups and other actors in the ecosystem, e.g. to receive feedback on their ideas.

Research on these recent types of CVUs has so far been limited. In order to gain a better understanding of this phenomenon, Paper IV seeks to identify the processes, which are taking place in the context of interactions between the incumbent company, the CVU and the ventures. Then, in the next step, Paper IV investigates how the identified processes relate to corporate innovation strategy.

To address these research questions, Paper IV employs a qualitative-empirical research design (Eisenhardt & Graebner, 2007). The sampling strategy focused on CVUs, which were set up within six years prior to the interview. For data collection, we conducted semi-structured interviews with decision makers in 13 different CVUs. Using a multiple-case study approach (Yin, 1993), the paper develops three important contributions.

First, Paper IV shows the effects that the incumbent firm as an additional major actor has on the processes enfolding in business incubating organizations. In particular, we identify distinct processes that enable the corporate parent to subtly, but decisively influence operations of the CVU. Second, we analyze how these processes fulfil three core functions, which enable

strategic knowledge search, selection of strategically fitting ventures and subsequent strategic collaboration. Finally, we show how these functions help the CVU to fulfil its organizational charter in either a more exploitative or a more explorative mode.

6 Contributions

After previous chapters have outlined the research approach and content, this chapter highlights the areas of synergy as well as individual contributions of the paper, which are part of this the cumulative dissertation. As I will outline below, the findings are relevant both theoretically and practically.

Paper I contributes to the literature on corporate foresight. Using a conceptual approach, the paper first reviews foresight literature and how foresight theory and practice have changed over time. Then, by integrating insights from the previously disparate literature stream of research on open innovation, the paper demonstrates that firms can improve foresight results by utilizing new possibilities to search for future-related knowledge beyond their organizational boundaries. On this basis, Paper I identifies three individual elements, which shape the understanding of open foresight. First, openness is expressed in terms of a broader and more diverse range of external sources that a firm can involve to collaborate with or source knowledge from. These include, for instance, (lead) users, buyers, suppliers, business partners, research institutions, or members in (online) communities or crowds. Second, openness refers to a holistic ability that is institutionalized in the organization. This means that open foresight is typically characterized by a high degree of participation and interaction and can be understood as an orchestrator of distributed knowledge sources that integrates views from actors from all parts of the organization. Third, openness refers to the application of established methods from the open and user innovation literature, which thereby expands the foresight toolbox. Based on these elements, the main theoretical contribution of Paper I

lies in advancing foresight and developing a clarified and more ’open‘ understanding of the concept of ”Open Foresight“.

In addition, the findings of Paper I are valuable for foresight practitioners. Although they have already utilized a broad range of tools and methods while drawing on internal and external knowledge sources, ”Open Foresight“ is not just another buzzword concept but represents the first systematic approach highlighting the potential of benefitting from external knowledge sources.

Paper II contributes to the literature on corporate foresight. Building on Paper I, which provides an extended and more ‘open’ understanding of foresight, Paper II narrows its focus to those possibilities, which involve users as knowledge source. Using a conceptual approach, the paper reviews literature on open and user innovation in order to identify arguments why opening up foresight to users can improve foresight results. Paper II thus highlights that users and particularly lead users have superior need-related knowledge and that incorporating such knowledge is helpful to broaden the search space and minimize the risk of overlooking harmful developments or missing opportunities. Furthermore, the paper reviews methods that are suitable for drawing on user knowledge, including methods from open and user innovation as well as methods from traditional foresight that can now be conducted in significantly more open ways. One of the main contributions then lies in typologizing these methods: they rely on inviting lead users (e.g. workshops, Open Delphi), utilizing dialogue and data from online communities and social networks (e.g. netnography, big data analysis), or apply crowdsourcing (e.g. “TrendWikis”, idea-spotting networks, prediction markets, collaborative forecasting games). Another main contribution lies in the analysis and juxtaposition of these methods regarding their advantages, disadvantages and boundary conditions. This discussion is structured along key design dimensions, which include the numbers of involved users, the

mode of interaction, the degree of control maintained by the organization to steer the direction of user activities, as well as the type of incentives to motivate users to contribute to foresight.

Finally, Paper II is also highly relevant to practitioners, who plan to integrate user knowledge into their foresight process. The selection of suitable methods depends on the firm's specific objectives. In that sense, the overview of methods and their advantages, disadvantages and boundary conditions offered in Paper II may give guidance to managers selecting the method that is most appropriate for their purpose.

Paper III contributes to this research strand by reviewing the state-of-the-art literature on incubators and accelerators in general. Using a bibliometric and co-citation analysis, the paper systematically identifies relevant articles from the Web of Science databank and measures their impact in terms of the number of citations. As a first contribution, tables report the most cited authors and keywords and a graph visualizes the co-citation network, which displays the clusters of the literature and the most central articles. The second contribution consists of an overview of the main findings from the extant literature with a focus on the more central papers. This part includes (1) studies on origins, definitions and typologies of incubators, (2) studies on the incubation process, and (3) studies on impact and performance. While summarizing this literature, we found that there is a significant level of confusion regarding terminology. To address this issue, Paper III reviews different existing definitions, discusses the advantages and disadvantages thereof, and finally derives a reconcilable definition of the concept of business incubators as the paper's third contribution. On this basis, the core characteristics of incubators are pointed out in contrast to similar organizations in the entrepreneurial ecosystem. Finally, as a result of the literature review, some research trends and new topics became evident. The fourth contribution of Paper IV thus lies in highlighting areas (including corporate incubation) where new research is needed and in outlining a research agenda accordingly.

The paper is also very useful for practitioners, who want to get an overview of relevant research findings in a comprehensive way. In particular, the overview on incubation processes can provide guidance for practitioners, who set up their own incubators and accelerators. In addition, the discussion of definitions and typologies as well as the reconciled definition should help to eliminate confusion regarding terminology, which is also evident in practice.

Paper IV picks up on the previously identified research agenda and makes a substantial contribution to the literature on corporate entrepreneurship, particularly corporate venturing. The results of our empirical study are based on interviews with managers in 13 different corporate venturing units (CVUs), including corporate incubators, accelerators and company builders. Using a multiple-case study approach, the paper develops three important contributions. First, we identify seven processes taking place in the context of the interactions between the three core stakeholders, i.e. the corporate parent, the CVUs as well as the startups and ventures. Second, we found that these processes interlock and serve important functions, which enable knowledge search, selection of strategically fitting ventures and subsequent strategic collaboration. Third, we discuss how these functions help the CVU to fulfil its organizational charter in either a more exploitative or a more explorative mode.

With the progressing diffusion of the phenomenon of different CVUs in practice, our results are also highly relevant to practitioners working in the field. Our study described how corporate incubators, accelerators and company builders contribute to corporate innovation strategy in different ways. Thus, our results are helpful for managers who need guidance regarding the decision, which type of CVU is most appropriate for their purpose and how to set it up.

7 Directions for Future Research

As highlighted in the previous chapter, this cumulative dissertation offers valuable theoretical and managerial contributions to literature at the intersection of foresight, innovation management and entrepreneurship research. Moreover, during our research we identified further avenues for future research. Thus, the purpose of this chapter is to summarize the most promising research questions.

First, open foresight emerged as a new research field and leaves manifold avenues for further research. Papers I and II are conceptual in nature and outline possible approaches for sourcing future-related knowledge from external sources. Hence, a next logical step would be to investigate empirically how firms are actually making use of open foresight methods. According to the suggestion that open innovation research should consider multiple levels (West et al., 2014; Vanhaverbeke et al., 2014), prospective studies should explore how foresight activities are conducted at the level of individuals, groups, firms, networks, communities, or entire branches. In order to fully reap the benefits of external knowledge integration, a better understanding of context factors and areas to apply open foresight methods is necessary. Therefore, future research should tackle the questions when to involve which type of external source and, furthermore, under which conditions open foresight methods bear greater potential than 'traditional' approaches to foresight.

Second, the literature review in Paper III provides an overview of state-of-the-art research on business incubation and shows that earlier research did not use a consistent theoretical perspective (Hackett & Dilts, 2004). Only recently, a paper by Mian et al. (2016) identified some theories that can be useful for studying incubators. These include social network and social capital theory, institutional theory, structural contingency theory, stakeholder view and resource based view. These theories can guide further research on theoretical foundations of incubator research, which is still in a nascent stage. Moreover, Paper IV explores how

processes in corporate incubators and other types of corporate venturing relate to corporate innovation strategy. Future work could focus stronger on the existing theory on open innovation to understand how a corporate sponsor may benefit from collaboration with startups as a means of outside-in innovation (Weiblen & Chesbrough, 2015). In addition, research on absorptive capacity (Cohen & Levinthal, 1990) can be a useful theoretical framework to study how the knowledge generated in a CVU is assimilated and applied in the incumbent company. Thus, while we interviewed CVU managers with the intention to understand their mediation role, further studies could engage in interviews with employees and managers in order to understand how knowledge and innovation are absorbed in the established company.

Third, considerably more work is required to analyze the antecedents and outcomes of business incubation. To this end, quantitative multi-level studies should be conducted, which investigate interactions across the individual levels of the incubator, the incubated firms as well their ecosystem. Gaining a better understanding of these different kinds of dynamics is even more relevant in the context of corporate incubation, as the incubation process involves an additional stakeholder and, thus, more complex interactions.

Fourth, Paper IV provides an empirical investigation of the recent wave of corporate venturing units. To this end, we sampled only CVUs established within six years prior to the interview. As the CVUs were so young, many interviewees stressed the need to run them like a startup itself, which involves a lot of experimenting, pivoting and learning along the way. As a result, CVUs seldom used KPIs for measuring their performance, or the definitions were only vague. Therefore, we were able to identify and describe the processes between core stakeholders, but we were not able to assess their effectiveness. Future research needs to explore the medium-to-long term impact of CVUs to evaluate whether they live up to their expectations. For instance, interesting research avenues include the following questions: How

many products are successfully integrated in the product and service portfolios of the incumbent firm? How sustainable are the cooperations between established companies and startups? How many ventures become new business lines in an established corporation?

Fifth, Paper IV focuses on the question of how exchange and collaboration with startups can help established companies strengthen their own innovation performance. However, corporate incubation is a possible win-win-scenario for both sides and startups can benefit in several ways from the unique resources and services of the incumbent company. Thus, future research should focus on how corporate assets can help startups grow and establish themselves successfully in the market. In addition, further research should assess the medium- and long-term success of the startups after they have graduated or moved out from the corporate incubator or accelerator.

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Paper I:
Open Foresight: Exploiting Information from External Sources

Daniel Ehls; Sabrina Korreck; Reimo Jahn; Michael Andreas Zeng; Sara Heuschneider; Cornelius Herstatt; Hans Koller; Sebastian Spaeth

Abstract:

Anticipating future developments is an important activity to proactively address upcoming threats and opportunities for firms, frequently concentrated in the business function Corporate Foresight. While the concept of Corporate Foresight is well established, recently the term 'Open Foresight' emerged, describing an open perspective towards the environment and incorporating external sources into foresight activities. However, in relation to the development of the foresight research field knowledge from external sources has never been neglected in foresight processes as a way to anticipate different future developments. A strength and innate characteristic of foresight is its openness to external signals. Addressing this contradictory view, this papers proposes a reconciled view on 'Open Foresight' and why an open minded view and incorporation of latest developments, also from neighboring research field helps to improve Corporate Foresight and anticipating future developments.

Keywords: Open Foresight, Distributed Information Sources, Corporate Foresight, Innovation Management, Technology Intelligence

This paper is available online at SSRN:

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1 Introduction

In order to anticipate future developments and proactively address upcoming threats and opportunities, corporate foresight activities have become increasingly important (Nelson & Winter, 1982). Today, sensing and seizing future developments represents a core activity of corporate strategy (Teece, 2007) and brings the internal capabilities of the firm and business environment together. Especially in the last decade, we witnessed the rise of a new form of rivalry and information sources. Prediction markets accurately anticipate external dynamics (Graefe et al., 2010), online communities facilitate an intense collaboration (Janzik & Raasch, 2011; Dahlander & Wallin, 2006; Jeppesen & Frederiksen, 2006), and user created products supersede products of incumbent firms (Henkel, 2006; West & Galagher, 2006). A common trait across these observations is the distributed nature of participants and external knowledge sources, particularly studied in the field of open and user innovation (Chesbrough, 2003; West et al., 2014; von Hippel, 1988; 2005) as well as in the latest strategic and organization's science search literature (e.g., Afuah & Tucci, 2012).

In this context, the concept of "open foresight" has recently emerged as a new research stream in the foresight literature (Daheim & Uerz, 2008; Gattringer & Strehl, 2014a). However, in relation to the development of the foresight research field (Reger, 2001; Rohrbeck, 2015), knowledge from external sources has never been neglected in foresight processes as a way to anticipate different future developments. A strength and innate characteristic of foresight is its openness to external signals. Addressing this contradictory view, the question arises whether open foresight constitutes a genuinely new and broader understanding of the foresight concept or whether it rather turns out to be "old wine in new bottles".

We posit none of the above and rather believe in a middle ground. With the rapid rise of external opportunities and the advent of the Internet and open collaboration mechanisms over the last decade, we call for a stronger attention to these sources of weak signals being

integrated into corporate foresight. In applying “open foresight”, we believe that organizations can respond to the call to account for a connected and faster moving world and develop a holistic foresight ability as an integral part of a company’s strategy (Rohrbeck et al., 2015). The possibilities of integrating methods and knowledge sources from the open and user innovation theory into foresight activities lead to an enrichment of ‘established’ foresight.

In order to analyze the outlined debate, our paper is structured as follows: In section 2, we briefly review the current state of (corporate) foresight literature and outline how concept and practice of foresight have evolved over time. In section 3, we explain why the approach of foresight might benefit from a more "open" understanding. Drawing on the open innovation literature, we describe such an open understanding of foresight and outline individual elements that are considered crucial in this advanced understanding. This section concludes with our understanding of open foresight. The last section is dedicated to outlining future research streams and highlighting specific research topics in need of further examination.

2 Established Understanding of Foresight: Literature Review

2.1 Scope of Foresight

Several overlapping concepts have been used to describe how organizations learn about possible future developments of strategic importance, e.g., Technology Foresight (Anderson, 1997), Forecasting (Martino, 1983), Scouting (Rohrbeck, 2006), Competitive and Business Intelligence (Brockhoff, 1991; Ashton et al., 1991), Futures Studies (Porter et al., 2004), and, among many others (Martin, 2010; Miles, 2010; Linstone, 2011). Unfortunately, these terms have often been used interchangeably and their definitions seldom been distinguished (Amsteus, 2008; Horton, 1999). However, all concepts rely on the exploration of possible future developments and as such on the identification of weak signals (Ansoff, 1975).

In order to adapt to an ever-changing environment, organizations need to be able to detect and react to such changes early to ensure their survival (Nelson and Winter, 1982). Most events and developments coming as a surprise to a firm do not come from nothing. Often weak signals exist beforehand, foreshadowing the possible occurrence of a particular event or development. Ansoff argues that "we must be prepared for very vague information, which will progressively develop and improve over time" (Ansoff 1975, p. 24). By exploring these weak signals and proactively addressing future developments firms can build up "before-the-fact strategic preparedness" (Ansoff 1975, p. 22), respond earlier and have their responses better planned and executed. This includes the creation of future-related insights that help reducing uncertainty and initiating debate about new business paths. Moreover, the identification of potential markets, new business opportunities, or up-coming threats contribute to a firm's understanding of its dynamic environment and may enhance its future adaptability.

Research on the issue of identifying weak signals has continuously advanced over time in both theory and methodology. Extending the overview of Rohrbeck et al. (2015), Figure 1 summarizes the historical development of foresight research over time with respect to the major approach, used methods and organizational embedding of foresight. Beginning in the 1950s, foresight was at first an isolated task within the organization and primarily an exercise of collecting data and comparing present with planned data through mainly quantitative methods (Reger, 2001; Rohrbeck et al., 2015). In the 1970s, the focus moved towards identifying alternative futures to prepare for possible scenarios instead of trying to predict the actual future (Burmeister & Schulz-Montag, 2009). It became apparent that linear economic planning was no longer sufficient so that, as a consequence, qualitative methods such as the scenario technique or expert-based methods became the center of attention (Bradfield et al., 2005; Rohrbeck et al., 2015). Over the years, the scope of foresight has widened: an economic- and market-related orientation has been adopted and experts from academia and

industry included (Georghiou, 2001). In the 1980s and 1990s competition in markets increased and new foresight methods such as trend analysis and roadmapping emerged emphasizing a mix of both qualitative and quantitative methods (Burmeister & Schulz-Montag, 2009, Rohrbeck et al., 2015). The 1990s and 2000s were characterized by the fact that technological developments were also dependent on political and societal factors. Consequently, social stakeholders such as government representatives, consumer groups, and non-profit organizations joined the debate about foresight (Georghiou, 2001). During this period, foresight emerged as an organizational ability that is established as a systematic practice and leverages interactive, exploratory methods (Rohrbeck et al., 2015).

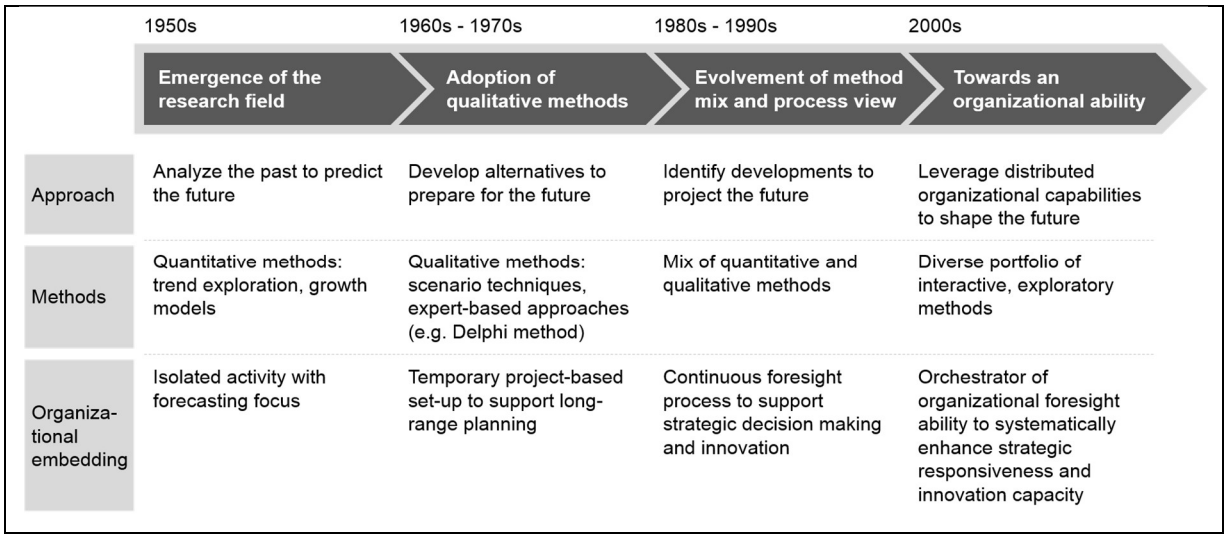

Figure 1: A historical overview of foresight research

While foresight has always included consideration of the environment, it often involved a one-way flow of information from the outside to the inside of organizations. Daheim and Uerz (2008) identify four waves of foresight models over time. The first three waves are based on assumptions that the future can be foreseen with the help of experts' opinions, calculated by using mathematical models or projected by trend research. These waves have predominated over foresight practice at different times and then abated. In contrast, the current wave of corporate foresight is based on the premise that interaction is increasingly important to shape the future.

In summary, foresight has developed over time from a narrowly defined, technology-focused activity towards a holistic organizational practice involving a diverse set of methods and stakeholders to pursue a proactive approach towards shaping the future.

2.2 Definition and Nature of Foresight

Against the background of the outlined evolvement of foresight in academia and practice over time, a variety of definitions were developed. In fact, there is no widely accepted definition of foresight but rather a plethora of understandings and usages of the term (Amsteus, 2008; Horton, 1999). With respect to the nature of the concept, foresight has been referred to, for example, as a tool, a process, or an ability. Table 1 outlines selected definitions in terms of their respective understanding of the nature of foresight. While the definitions of Coates (1985), Georghiou (1996), and Martin (1995) have their origin in governmental foresight, they have been used extensively in the foresight literature as a starting point for shaping the discussion on corporate foresight. In contrast, the definitions of Rohrbeck et al. (2015), Slaughter (1999), and Tsoukas and Shepherd (2004) are directly focused on corporate foresight.

Regarding the nature of foresight, it has been argued in the literature that foresight cannot only be understood as a tool or set of techniques since it involves procedures to enable feedback mechanisms between the involved actors (Irvine & Martin, 1989). Moreover, the systematic nature of foresight has been emphasized by pointing towards defined process steps to actively explore possible future states (Cunha et al., 2006; Martin, 1995). As regards this process-related nature of foresight, it has been criticized that the linear, processual understanding does not reflect the need for participation and interaction to recognize ongoing changes and shape the future of the focal company (Eriksson & Weber, 2008). Following this line of thought, foresight can be understood as an organizational ability that is

institutionalized and developed within the organization to create a future discourse (Slaughter, 1999; Tsoukas & Shepherd, 2004). Thus, foresight is not only restricted to an isolated application of tools or a linear process involving a limited number of actors but rather represents a collective ability integrated into the organizational practice (Eriksson & Weber, 2008; Dufva & Ahlqvist, 2014).

Definition	Author(s)	Nature of foresight
"[…] overall process of creating an understanding and appreciation of information generated by looking ahead. Foresight includes qualitative and quantitative means for monitoring clues and indicators of evolving trends and developments and is best and most useful when directly linked to the analysis of policy implications."	Coates, 1985	Process
"[…] systematic means of assessing those scientific and technological development which could have a strong impact on industrial competitiveness, wealth creation and quality of life."	Georghiou, 1996	Tool
"[…] process involved in systematically attempting to look into the longer-term future of science, technology, the economy and society with the aim of identifying the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits."	Martin, 1995	Process
"[…] ability that permits an organization to lay the foundation for future competitive advantage. This ability is based on identifying, observing and interpreting factors that induce change, determining possible organization-specific implications, and triggering appropriate organizational responses."	Rohrbeck et al., 2015	Ability
"[…] ability to create and maintain a high-quality, coherent and functional forward view and to use the insights arising in useful organisational ways. For example to detect adverse conditions, guide policy, shape strategy and to explore new markets, products and services."	Slaughter, 1999	Ability
"[…] ability to see through the apparent confusion, to spot developments before they become trends, to see patterns before they fully emerge, and to grasp the relevant features of social currents that are likely to shape the direction of future events."	Tsoukas and Shepherd, 2004	Ability

Table 1: Selected foresight definitions

Foresight cannot aim at predicting the future but it can make individuals think about possible future directions (Cachia et al., 2007). According to Daheim and Uerz (2006), foresight is not about a solely reactive understanding of action ('The future comes and we react on it') but rather means a pro-active interpretation of action ('The future comes but we can shape it'). Instead of understanding the future as an 'inevitable destiny', every firm can – in its own range of influence – shape the future pro-actively instead of trying to adapt to unforeseeable

futures (Barker & Smith, 1995). Foresight can further lead to greater awareness of environmental changes and associated opportunities and threats, foster conversation and organizational learning, and support adjustments to the strategy and appropriate reactions (Rohrbeck & Schwarz, 2013). As these insights are relevant for different functional units such as strategic management, innovation management, and corporate development, foresight activities are characterized by their cross-functional nature (Rohrbeck & Gemuenden, 2011). However, the value contribution of corporate foresight can only be fully exploited when insights gained from foresight activities result in organizational action and change (Rohrbeck, 2012; Thom, 2010).

In summary, foresight can be understood as an organizational ability to systematically explore potential futures. Its aim is to detect weak signals beyond the boundaries of an organization and to identify the social, political, economic, ecological, and technological factors and trends that are likely to affect the organization in the medium to long run, including the way in which such influence is exerted. However, we see a potential to enrich the established foresight understanding by opening up the described foresight activities even more to integrate external knowledge sources.

3 Advancing Foresight towards a More 'Open' Understanding

3.1 Connotations of Open Foresight

Vast amounts of research, theoretical insights and new methods from the open innovation (Chesbrough, 2003; West et al., 2014) and user innovation field (Baldwin & von Hippel, 2011; von Hippel, 2005) have been developed over the last decade. These large bodies of research deal with topics and methods such as (lead) user innovation (von Hippel, 1986; Franke et al., 2006; Skiba & Herstatt, 2009), crowdsourcing (Afuah & Tucci, 2013; Boudreau & Lakhani, 2013; Piezunka & Dahlander, 2015), co-creation (Sawhney & Prandelli, 2000;

Prahalad & Ramaswamy, 2004; Fueller et al., 2009), online communities (Kim, 2000; Janzik & Raasch, 2011; Zeng, 2014), or open source software development (Lakhani & von Hippel, 2003; von Krogh et al., 2003; Belonzon & Schankermann, 2012). The entire open and user innovation research is focusing on the central question of how to integrate and leverage external distributed knowledge. However, foresight research has so far not fully benefited from drawing on these insights and methods. We argue that using insights from the above mentioned literature, particularly the open and user innovation research, offers extended possibilities to perform foresight and allows firms to considerably extend the search for future-related knowledge further beyond their organizational boundaries.

The topic of 'open foresight' has so far only appeared in a few academic articles. Daheim and Uerz (2006, 2008) first coined the term in a presentation where they referred to the 'next wave' of corporate foresight, which is essentially "based on the assumption that businesses can shape future contexts and markets by anticipating through an open dialogue the dynamic interaction between social, technological and economic forces" (Daheim & Uerz 2008, p. 332). In subsequent years, Mietzner (2009) used the term closed foresight to summarize all foresight activities taking place within the firm in contrast to open foresight, which she understood as the opening of the process and the utilization of the firm's outside world. Miemis et al. (2012) denoted open foresight as a "process for analyzing complex issues in an open and collaborative way, and to raise the bar on public discourse and forward-focused critical thinking" (p. 92). In addition, four rather practice-oriented articles exist. Rau et al. (2014) describe different designs of open foresight workshops, which they understand as valuable means for collaborative opportunity identification. Gattringer and Strehl (2014a, 2014b) focus on the open foresight process and particularly on the challenges of the pre-foresight phase. Rudzinski and Uerz (2014) refer to the case of Volkswagen's implementation of open foresight to enable the analysis and discussion of different future strategies and future innovations.

Considering these publications, the term open foresight is partly used with varying meanings in which the notion of openness is associated with e.g. open innovation, open access, open participatory structure, open dialogue, open process, and open thematic perspective. Overall, the descriptions of the authors' understanding of open foresight are rather terse and remain sketchy. A clear and unified definition of the term open foresight has not yet emerged in the literature. Building on a synthesis of previous contributions, we aim to give an overview of the current status of research, harmonize the terminology and provide a deeper description of the construct of open foresight. As we particularly draw on insights from the open and user innovation literature, we contribute to creating a stronger linkage between foresight and other management research fields. In the following, we first discuss the central elements of open foresight. These were identified as crucial when evaluating the literature from the field of open and user innovation as well as based on current literature on foresight, particularly open foresight. The outlined elements will then provide the basis for our understanding of the term, which is subsequently defined at the end of this section.

3.2 Elements of Open Foresight

The understanding of open foresight was inspired by the concept of open innovation (Chesbrough, 2003). Both concepts exhibit some parallels as they share the notion that valuable ideas can emerge from inside or outside the firm. In subsequent years, the definition of open innovation was revised (Chesbrough, 2006; Chesbrough & Bogers, 2014) so as to stress the intentionality of knowledge flows. Likewise, the concept of open foresight can simultaneously be related to "purposively managed knowledge flows" (Chesbrough & Bogers 2014, p. 17). However, while open innovation considers both inflows and outflows of knowledge, open foresight is targeted mainly at the inbound sourcing of external knowledge into the firm.

As Dahlander and Gann (2010, p. 700) point out, "openness is in part defined by various forms of relationship with external actors and is thus closely coupled to a broader debate about the boundaries of the firm". In this context, open foresight can be understood as a systemic inquiry into the future, which permeates organizational boundaries in order to acquire future-related knowledge from external actors. While firms have to some extent always relied on knowledge from outside (e.g., Becker, 2002), open foresight puts much stronger emphasis on the integration of various external sources. In that sense, the theoretical concept of open foresight better captures the changes in foresight practice that have resulted due to increased connectivity. Drawing on the open innovation literature, we essentially identify three elements to shape the understanding of open foresight, which are outlined in the following.

Openness in Terms of a Broader and More Diverse Range of External Sources. Literature on open and user innovation has broadly documented practices of firms to collaborate with or integrate knowledge from external sources. Particularly (lead) users, buyers, suppliers, business partners, research institutions, or members in (online) communities or crowds are valuable sources for innovation processes (Koput, 1997; von Hippel, 1986). They can also be utilized towards exploring possible alternative futures as they may possess valuable information about trends and developments within the firm's environment. Not only does a broad knowledge base promise richer future scenarios, but fresh perspectives may also challenge basic assumptions deeply rooted in the mind-set of the firm's employees (Rau et al., 2014). Here, the open innovation literature highlights the advantages of utilizing a variety of knowledge sources in order to derive relevant insights (Katila & Ahuja, 2002; Leiponen & Helfat, 2010). In the context of open foresight, a broader and more diverse group of sources can help turn attention towards issues that might not have turned up if foresight were conducted among a more homogenous group.

Besides common external sources from the open innovation literature, an eligible external source for open foresight can in principle be any person having relevant future-related knowledge regardless of whether or not they have a stake in, or already have an existing relationship with the firm.

We thereby explicitly include possibilities to source future-related knowledge through e.g. passive observation in online communities or analysis of web-mined data. In this context, firms can open up foresight to different degrees. For instance, Rau et al. (2014, p. 32f.) distinguish three groups of actors that can become involved in open foresight: "family" refers to internal experts from other business units, "friends" includes external experts and stakeholders, and "strangers" are unknown individuals with whom the company has had no prior contact.

While authors of open innovation literature stress that a "wide range of external actors and sources can help […] achieve and sustain innovation" (Laursen & Salter, 2006, p. 131), the obvious rationale for open foresight is that a wide range of external actors and sources can help enhance foresight results. When foresight is mainly conducted within an organization involving e.g. top management or few experts, the activities tend to be too focused on the familiar, drawing only on closely related knowledge domains (Rosenkopf & Nerkar, 2008). In contrast, the attempt to consider diverse perspectives on the future is crucial for foresight (Könnölä et al., 2007). In that sense, knowledge from external actors can challenge internal assumptions and typical "group think". Through the integration of external sources, the search space can be significantly broadened (Katila, 2002). Thus, by taking a holistic view of contextual factors that may, directly or indirectly, affect a firm, open foresight can reduce the risk of missing latent but potentially impactful developments.

Furthermore, the search space also depends on the aims a firm seeks to achieve. This leads to a portfolio of different search strategies with varying risk profiles (Dahlander et al., 2014).

For open foresight, being thematically open and scanning the entire environment appears as a useful approach if the firm seeks to gain a broad view of potential future trends. However, in other instances, it may be more reasonable to narrow down the number of sources and adjust the search depth to an optimal level in order to avoid unproductive "over-search" (Laursen & Salter, 2006). Especially in the later foresight phases where the focus lies on deriving implications from identified general trends for the specific organization, it may be helpful to limit the search space to specific questions or areas of observation. Naturally, open foresight will be ideally targeted towards areas in which external actors hold superior knowledge with relevance for the focal firm. For example, by conducting open foresight with (lead) users firms will be better prepared to perceive changing needs and preferences of users as well as trends in social behavior.

Openness in Terms of a Holistic Ability that is Institutionalized in the Organization. The availability of an increased range of knowledge sources for foresight activities is contrasted by a limited time and attention span of organizational decision makers (Ocasio, 1997). To address this issue, the need to develop a holistic organizational foresight ability is being highlighted in the literature (Rohrbeck et al., 2015). Instead of limiting foresight to a process or organizational routine, foresight becomes a capability that is ideally spread across all actors of the firm. Being institutionalized within the firm, open foresight can thus be understood as an orchestrator of distributed knowledge sources that integrates views from all parts of the organization (Daheim & Uerz, 2008; Rohrbeck et al., 2015). It is, however, obvious that this ability needs to be developed over time and is not readily available by setting up a systemic foresight process (Slaughter, 1997).

In this context, a high degree of participation and interaction is considered as a constitutive feature of open foresight. Miemis et al. (2012) understand open foresight as an approach that requires a participatory structure with open access and clear incentives for participation.

Similarly, Daheim and Uerz (2008) understand open foresight as an open dialogue and put a strong focus on communication and the discussion about potential futures. While participatory approaches towards foresight constitute an increasingly important aspect, it is not a mandatory one. The open foresight concept also covers activities that can be performed without the consent and active collaboration of actors, such as the observation of online communities to derive future trends (e.g., Kozinets 1998, 2010).

Openness in Terms of a Wider Range of Applicable Methods and Tools. Magruk (2011) emphasizes the unspecified set and free selection of methods as one of the characteristics of the foresight process. While there is a multitude of methods generally available and well suited for the purpose of foresight (see Popper (2008) for a review of methods), traditional foresight literature often focuses on scenario technique, roadmapping, and the Delphi method, amongst others. As pointed out above, applying methods from open and user innovation to foresight offers new possibilities to source external knowledge and thus expands the foresight toolbox. Examples of open and user innovation methods that are suitable for foresight include e.g. observing communities ("netnography"), crowdsourcing, or conducting workshops with lead users or network partners (von Hippel, 1986; West & Bogers, 2014). These established methods from the open innovation literature may also be useful for corporate foresight to widen the scope of included knowledge sources and enable a more participatory foresight approach.

Moreover, advances in information and communication technologies (ICT), particularly the internet and social media, have decreased the costs of communication and allow a wide range of geographically dispersed people to participate and contribute their knowledge (West & Bogers, 2014). This development functions as an important enabler for the implementation of open foresight methods. Using Web 2.0 technologies in the open foresight context may enhance knowledge retrieval and enables the firm to keep pace with the constantly changing

environment (Rohrbeck et al., 2013). In this context, methods such as prediction markets, social scanning and rating, or wikis are discussed (Schatzmann et al., 2013). In fact, a global Delphi study has even found that ICT is likely to revolutionize the practice of foresight until 2020 (Keller & von der Gracht, 2014). In addition, a broad variety of ICT tools is available that may support and further complement open foresight activities. Examples of foresight support systems include trend databases, scenario software, and tools for creative group decision-making (von der Gracht et al., 2015).

Towards a Reconciled Understanding and Specification of Open Foresight. Based on the outlined elements, we understand open foresight as the systematic use of distributed information sources in order to anticipate the future corporate business environment and support an organization's strategic decision making. It is institutionalized within the organization and often conducted interactively with outside actors. Open foresight draws especially on insights and methods gained from the open innovation research.

With respect to the historical development of corporate foresight towards an organizational ability, open foresight does not constitute a new paradigm but rather an enrichment of the established understanding. Given the outlined dimensions of openness, we see an underrepresented subject of research within the current foresight literature, which is being addressed by the concept of open foresight.

4 Outlook and Research Agenda

Starting with the assumption that there is an increased need for foresight in an ever-changing world, we posit that a systematic use of external knowledge sources can vastly improve companies' anticipative capabilities. We further posit that the methods and knowledge sources known from open and user innovation have not been sufficiently integrated into the foresight literature. Drawing on the research on open innovation, we presented an extended

open foresight concept that shall enrich the “traditional” foresight understanding with regard to integrated methods and the systematic use of distributed knowledge sources.

In the course of this paper, we considered the question whether open foresight was merely another buzzword concept describing activities that have actually been part of foresight practices among companies for decades. Or, in other words: Is open foresight essentially merely “old wine in new bottles”? Undoubtedly, foresight practitioners have already utilized a broad range of tools and methods while drawing on knowledge sources both inside and outside a focal organization’s boundaries. However, to the best of our knowledge the open foresight concept represents the first systematic approach focusing on the potential of these capabilities. Regarding the insights that open and user innovation brought to innovation management we expect open foresight to likewise cause enrichment for foresight. We therefore understand open foresight not as old wine in new bottles but rather as an extended concept for the traditional foresight approach to systematically benefit from distributed knowledge sources. Against the background of its recent emergence open foresight as a research field leaves numerous research questions calling for further investigation:

First, our postulation is conceptual as it lacks specific empirical evidence. Thus, foresight-specific and theoretically informed in-field research is inevitable that aims at exploring how firms actually implement open foresight. Based on each firm’s individual context in terms of resource requirements, branch, customer needs, partnerships, market prospects, etc., a plethora of distinguished approaches for conducting open foresight should be considered to meet these contexts. As West et al. (2014) and Vanhaverbeke et al. (2014) suggested for open innovation research, we also encourage analyzing foresight ventures at multiple levels, comprising e.g. individuals, groups, firms, networks, communities, or entire branches to meet the requirements of these contexts.

Second, regarding the aforementioned contexts of open foresight a range of other questions are also noteworthy: What are the circumstances under which open foresight bears greater potential than 'traditional' foresight? And, in contrast, what are circumstances under which open foresight cannot be more beneficial than traditional approaches? Deeper knowledge concerning the impact of open foresight may result in finding antecedents that are underrepresented in the literature so far, e.g. the need for a cultural change in a company or network (e.g. Das, 2009).

Finally, little is known about what kind of external sources are supportive and under which conditions. When to include e.g. lead users, lead suppliers, online communities, crowd platforms, etc.? How to motivate them to participate and how to integrate them efficiently? And how many should be integrated – separately or in combination – without jeopardizing communicative efficiency and value contribution (see e.g. Laursen & Salter 2006)? To answer these questions a holistic understanding of context factors and application areas for open foresight needs to be developed. Consequently, a potential future research task might be to construct a typology of implementation strategies.

As a newly emerged field of interest, open foresight provides great possibilities for both practice and academia. Considering the merits of external knowledge integration – as proposed by the open and user innovation literature – enterprises may benefit from 'opening up' their foresight activities even more. But it is also a major opportunity for academic research to engage empirically and theoretically in a promising field by exploring not only real-life business networks but also interaction patterns with less examined sources such as lead suppliers and (online-)communities.

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Paper II:
Opening up Corporate Foresight: What Can We Learn from Open and User Innovation?

Sabrina Korreck

Abstract:

Organizations find themselves in a fast-paced and increasingly complex and uncertain environment. Hence, they engage in foresight to understand weak signals and developments that may affect them in the medium to long run and build up "strategic preparedness". Literature on open and user innovation has described methods to tap into external knowledge sources and some have potential to enhance foresight results, but research has not yet fully benefitted from these insights. Thus, the aim of this article is to synthesize findings from both literatures and explain why users and user collectives are a valuable knowledge source for foresight. The contributions of the paper are twofold. First, the paper provides a typology of methods, which are suitable for drawing on user knowledge. Second, the identified methods are compared with regard to their advantages, disadvantages and boundary conditions.

Keywords: Open Foresight, Distributed Information Sources, Corporate Foresight, Innovation Management, User Innovation

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1 Introduction

In a rapidly changing world, corporate foresight represents a promising approach for organizations to identify emerging changes in their environment early and act accordingly in a timely manner. As firms develop an understanding of weak signals, trends and developments that may affect their business in the medium-to-long run, they build up "strategic preparedness" and prevent discontinuities that may come to them as a dangerous surprise (Ansoff, 1975). In addition, foresight helps organizations to recognize and exploit emerging opportunities more quickly and, thus, foster the firm's innovation capacity. Ultimately, organizations that keep a good vision on what is happening at their periphery can gain tremendous advantage over rivals (Day & Schoemaker, 2005).

Corporate foresight has continuously evolved over time (Rohrbeck et al., 2015). Foresight was typically conducted by firm managers and internal employees, and sometimes external sources such as networks (Reger, 2001) as well as analysts and consultants (Rohrbeck et al., 2015). Other external sources such as (lead) users, user collectives (e.g. communities and crowds), suppliers, buyers, research institutions, partner firms or even competitors have so far rarely played a role. This is remarkable, given that advances in information and communication technologies, among other factors, have increased the potential and decreased the costs of conducting searches for external sources (West & Bogers, 2013). Research on open innovation (e.g. von Hippel, 1988, 2005; Chesbrough, 2003; von Hippel & Baldwin, 2011) described how different approaches to source knowledge from external sources can help firms to support their innovative activities. Some of them have significant application potential to enrich 'established' foresight, but research has not yet fully benefitted from these findings.

Thus, this paper picks up on this need for investigation of those methods, which can be used for foresight. However, since open and user innovation literature is an umbrella term, which

encompasses many different methods and knowledge sources, trying to evaluate all of them would be clearly beyond the scope of one single article. Thus, the paper narrows its focus to methods that rely on knowledge of users and user collectives. Using a conceptual approach, the paper builds on a synthesis of previous findings from foresight as well as open and user innovation literature. In the context of the first research question, the paper seeks to identify: Which methods are suitable for sourcing user knowledge for foresight? However, no universal methodology or 'off-the-shelf' approach exists and the selection of suitable methods always depends on the firm's specific objectives (Slaughter, 2002; Magruk, 2011). Therefore, Paper II seeks to answer the second research question: What are the advantages, disadvantages and boundary conditions of these methods?

The paper is structured as follows: In the next section, a literature review on foresight, which is currently developing towards a more open understanding, is presented. The third section highlights why users are highly qualified sources of knowledge and why opening up foresight to users holds potential to improve foresight practice. In the fourth section, a typology of open foresight methods that are suitable for drawing on knowledge of users and user collectives is provided. In the fifth section, these methods are compared with a view to their advantages, disadvantages and boundary conditions. This discussion is structured along the following key design dimensions: (1) number of users involved, (2) mode of interaction, (3) governance mechanisms, and (4) type of incentives. Finally, the sixth section concludes and suggests areas for further research.

2 Moving from Foresight to Open Foresight

To date, there is no unified or commonly accepted definition of foresight. Instead, a broad variety of different definitions or similar expressions exist, which often denote different activities in firms (Reger, 2001). In general, foresight refers to an exploration of possible

alternative futures. At first, foresight involves gathering relevant information about possible future events and developments that will possibly affect the organization in the medium-to-long term. Thus, foresight typically takes a holistic view, i.e. it looks beyond the close and immediate market environment in order to consider political, economic, social, and technological ("PEST") factors. The resulting knowledge is then translated and interpreted in order to understand possible environmental changes and their implications. Finally, foresight involves a commitment to action, i.e. newly discovered insights lead to concrete action, which brings benefits to the organization (Horton, 1999). In that sense, foresight is perceived as an action-oriented approach not only to forecast or predict future states, but also to actively shape the future.

Firms conduct foresight for various reasons. In general, foresight implies a readiness to deal with long-term issues (Miles, 2010) and, therefore, provides a basis for firms to be better prepared to adapt to unfolding environmental changes. Often vague information exists, which foreshadows the occurrence of later events and developments. Information progressively develops and improves over time, but the later a firm reacts, the more likely it will be too late in making important decisions. Ansoff (1975) points out that the time remaining before the impact on the firm passes a critical benchmark is crucial: "For a threat this benchmark may be the level of loss beyond which the firm's survival is threatened; for an opportunity the point beyond which the cost of "climbing the bandwagon" can no longer be recovered through profits" (p. 24). Thus, through an improved awareness of so-called weak signals, foresight allows firms to act in a timely manner and have their responses better planned and executed in order to seize opportunities and avert dangers.

Rohrbeck and Gemünden (2011) studied how foresight activities can enhance a firm's innovation capacity and identified three roles. First, foresight can play the initiator role, i.e. "foresight triggers innovation initiatives by identifying new customer needs, technologies, and

product concepts of competitors" (p. 237). Second, foresight can play the strategist role, i.e. "foresight directs innovation activities by creating a vision, providing strategic guidance, consolidating opinions, assessing and repositioning innovation portfolios, and identifying the new business models of competitors" (p. 237). Third, foresight can play the opponent role, i.e. "foresight challenges the innovators to create better and more successful innovations by challenging basic assumptions, challenging the state-of-the-art of current R&D projects, and scanning for disruptions that could endanger current and future innovations" (p. 237).

Experts agree that no universal methodology for conducting foresight exists (Magruk, 2011). There is no satisfactory 'off the shelf' solution and foresight will take different shapes and forms in different organizations to reflect firms' goals and specific needs (Slaughter, 2002). Numerous methods are available for exploring possible alternative futures and literature on traditional foresight often focused on scenario technique, roadmapping, and the Delphi method, amongst others. Methods differ in their fundamental attributes. On the one hand, Popper (2008) distinguishes between qualitative, quantitative and semi-quantitative methods and finds that the use of qualitative methods is most popular, "due to the fact that the study of the future is inevitably informed by opinions and judgements based on subjective and creative interpretations of the changes (or lack of changes) creating or shaping the future" (p. 70). On the other hand, building on Georghiou's (2001) typology, Popper (2008) distinguishes foresight methods regarding their capability to gather or process information based on evidence, creativity, expertise, or interaction. Foresight methods consist of these capabilities to different proportions. In many cases, foresight methods complement each other and, thus, a combination of methods is often selected.

Research on foresight has over time continuously advanced in both theory and methodology (Reger, 2001; Rohrbeck et al., 2015). Previously, foresight was typically conducted within the firm's organizational boundaries and involved mostly internal managers and employees and

only some additional experts and consultants. However, internal actors often have difficulty to perceive possibly impactful information, as they are focused on day-to-day business or are locked in prevailing mindsets and power structures of the organization; in addition, the value of expert judgment in foreseeing change is disputed (Rau et al., 2014).

In the meantime, advances in and a growing availability of information and communications technologies have facilitated approaches to integrate externals into innovative activities (Dodgson et al., 2006). Likewise, information and communication technologies are likely to revolutionize the foresight practice (von der Gracht et al., 2015). It appears that foresight practice increasingly evolves into a more open direction, thereby increasingly utilizing new methods to source future-related knowledge from external knowledge sources. In consequence of this development, foresight research takes up many insights, which have previously been elaborated in the literature on open innovation (for a review see e.g. Dahlander & Gann, 2010; Huizingh, 2011; West & Bogers, 2013). At the heart of this stream of research lies the idea that companies should become more open to external knowledge and ideas (Chesbrough, 2003). The meaning of openness relates to a broader debate on the boundaries of the firm and is expressed through various forms of relationships with external actors (Dahlander & Gann, 2010). For instance, the literature has documented involvement of (lead) users (Gassmann et al., 2006; Grimpke & Sofka, 2009), communities, crowds, suppliers (Li & Vanhaverbeke, 2009; Schiele, 2010), buyers, research institutions (Fabrizio, 2009; Cassiman et al., 2010; Harryson et al., 2008), partner firms or even competitors (Lim et al., 2010). Advances in information and communication technologies (particularly the Internet and social media) facilitated access to distributed knowledge and enabled novel approaches to source knowledge from, or collaborate with, external sources. Among the most important open innovation approaches are, for instance, crowdsourcing (Afuah & Tucci, 2013; Bayus, 2013; Boudreau & Lakhani, 2013; Piezunka & Dahlander, 2015), co-creation (Sawhney & Prandelli, 2000; Prahalad & Ramaswamy, 2004; Füller et al., 2009), and online communities

(Jannzik & Raasch, 2011; Kim, 2000). Some of these approaches can be used to explore alternative futures and hold potential for enhancing current foresight practice. Thus, the concept of "Open Foresight" as first coined by Daheim and Uerz (2006; 2008) refers to "the next phase of corporate foresight". However, to date, only few publications took up and elaborated on the concept; exceptions are e.g. Miemis et al., 2012; Rau et al., 2014. Apparently current foresight research has not sufficiently caught up on new possibilities and practices that make it possible to source user knowledge.

3 Potential Benefits from Integrating Users and User Collectives as Knowledge Source

In order to explore alternative futures, firms can get valuable input from individual (lead) users or tap the rich source of knowledge available in various different user collectives, such as (online) communities or crowds. The definition of users underlying this article covers not only the firm's own users, but also users from analogous markets, who face trends similar to that of the target market (Franke et al., 2013), as well as some nonusers, who are very knowledgeable about relevant future-related topics. Prior to the discussion of possible open foresight methods, an understanding of users' competences and knowledge is needed and of how their integration can potentially enhance foresight results.

Boundedly rational actors tend to conduct local searches, i.e. they look for solutions in the surroundings of their current position (Cyert & March, 1963; Nelson & Winter, 1982; Stuart & Podolny, 1996; Katila, 2002; Katila & Ahuja, 2002). However, when firms draw only on previous experiences, established views, already existing knowledge and familiar routines, they will only take into consideration a narrow solution space. Regarding foresight, this implies a high probability of blind spots remaining, and of potential harmful developments being ignored or promising opportunities being missed.

Diversity is a critical component of innovative capabilities (Cohen & Levinthal, 1990) in general. This also applies to foresight, where the "attempt to accommodate diverse perspectives on the future is central to the methods for the scanning of weak signals" (Könnölä et al., 2007, p. 611). Through the involvement of actors with diverse perspectives, the potential solution space can be significantly broadened. In this way, "Opening up the foresight activities to externals is a promising way to detect blind spots" (Rau et al., 2014, p. 31). A study by Jeppesen and Lakhani (2008) confirms the importance of involving people with alternative knowledge. In the context of a “broadcast search” problem, when information is disclosed widely and everyone is invited to participate, they examined which external solvers are able to provide successful solutions. They found that individuals, who come from a field of expertise that is far from the focal field of the problem, are more likely to come up with successful solutions than actors in the source problem field. As they are not bound to current thinking in the field of the focal problem, marginal persons can offer perspectives and heuristics that are novel and therefore useful for generating solutions to these problems.

Besides adding a novel perspective to foresight, users possess specific knowledge, which is very valuable to firms. Users can be considered as experts regarding need-related information, as they know their needs best and have the fullest information about how they want to use a certain product. In contrast, manufacturers possess information about solution possibilities as well as the production process itself. This means that users and manufacturers tend to draw on different local information when they innovate. However, bridging need and solution information between users and manufacturers is often very difficult, because information is sticky, i.e. it is costly to transfer a given piece of information to a specific location in a form useable by a knowledge seeker (von Hippel, 1998). In order to minimize costs incurred in connection with understanding user needs, it is therefore advantageous to source information from its origin and integrate user knowledge as closely as possible into the foresight process.

However, not all users are equally helpful. A crucial distinction between typical and lead users dates back from seminal work by von Hippel (1986). He had observed that typical users of a firm's existing products are not well positioned to assess new product needs and potential solutions. Typical users have a limited ability to conceive novel attributes and uses because they are too familiar with existing product attributes and constrained by their present real-world experience. In contrast, lead users "are familiar with conditions which lie in the future for most - and so are in the position to provide accurate data on needs related to such future conditions" (von Hippel, 1986, p. 796). Lead users have needs that foreshadow the general demand in the marketplace, but face such needs months or years before the bulk of that marketplace encounters them. This ability makes lead users an important knowledge source for foresight. By utilizing knowledge from lead users, a firm is better equipped to perceive changing habits and preferences of users and socio-cultural trends.

Lead users have a second important characteristic: As they are dissatisfied with the current market offering, they benefit significantly by obtaining a solution that caters to their needs (von Hippel, 1986). As they expect an innovation-related benefit, lead users are motivated to provide - and often freely reveal at no cost - information and contribute to the development of new products and services (von Hippel, 1986; von Hippel, 1988; Urban & von Hippel, 1988; Morrison et al., 2000; Morrison et al, 2004; Franke & Shah, 2003). Some lead users even develop their own innovations and their ideas were found to be more commercially successful as compared to ideas generated by traditional marketing research methods (Lilien et al., 2002). Even though foresight does not immediately aim at generating new ideas and new innovative products, it can be assumed that the incentive associated with obtaining a solution to lead users' needs still plays a role and motivates them to contribute to foresight.

Further research investigated the nature of lead users as well as the consequences of lead userness. Schreier and Prügl (2008) found that lead users are often characterized as having

innovative personalities, breaking with accepted modes of thought and action and discovering both problems and avenues of solution. In addition, they found that lead users tend to adopt new products faster and more heavily than ordinary users. Being an early adopter implies that lead users can act as opinion leaders, i.e. they can, combined with their importance as communication sources, play an important role in the diffusion process of newly launched products (Morrison et al., 2004). In that sense, lead users may influence (and perhaps even set) trends, which makes them an even more valuable source for foresight.

4 Methods for Drawing on User Knowledge

A growing body of literature on open innovation documents how companies reach beyond their organizational boundaries to search for knowledge from external actors. Many of these methods are also suitable for foresight and allow firms to utilize user knowledge for exploring possible alternative futures. In the following, the paper describes how firms can conduct foresight with lead users as well as community-based and crowdsourcing approaches. The methods partly complement each other and can be combined in many ways. In addition, some well-established methods from more "traditional" foresight exist, which can now be conducted in a significantly more open way or incorporate elements from open innovation.

4.1 Open Foresight Methods with Lead Users

The characteristics of lead users laid the basis for the development of the lead user method (von Hippel, 1986). The method aims to incorporate lead users in the fuzzy front end of the innovation process in order to learn more about emerging needs and, thus, help firms generate ideas and concepts for new products and services. The methodology involves four steps and starts with a definition of the search field and of the goals and requirements directed towards

the outcome of the process (Lüthje & Herstatt, 2004). In the next two steps, relevant trends as well as lead users, who lead these trends, have to be identified. To that end, firms can, for instance, screen a large number of users, use the pyramiding approach, or identify lead users in communities and social networks. At the end of the process, identified lead users are invited to workshops, where they discuss and collaboratively develop new product concepts together with company employees.

Trend analysis and identification are important functions of foresight; thus, it can be stated that foresight is already part of the lead user method. Previous research has clearly pointed out that, since lead users are familiar with future conditions, they are well-equipped to "serve as a need-forecasting laboratory" (von Hippel, 1986, p. 791) and "can be harnessed for forecasting purposes (Morrison et al., 2004, p. 361). Thus, while the lead user method relies on interviews with experts as well as secondary information sources such as academic publications, data banks and the internet for trend forecasting (Lühtje & Herstatt, 2004), one can argue that, in general, lead users themselves can contribute valuable input to the discovery of trends and open foresight. In order to conduct foresight with lead users, the lead user method needs to be adjusted as follows: At first, the search space has to be defined. In a second step, lead users, who are particularly knowledgeable in the specified search field, have to be identified. Finally, lead users are to be involved in the exploration of possible futures and trends. Rau et al. (2014) focus on foresight workshops as appropriate means of opening up foresight processes and enabling collaborative action. In the workshops, more "traditional" foresight methods can be employed. For instance, lead users can provide valuable input for creativity methods (such as brainstorming) or support the elaboration of scenarios.

Apart from the possibility to conduct physical foresight workshops, identified lead users can be interrogated as experts on future needs. To this end, interviews or surveys can be conducted. Of particular importance for foresight is the Delphi method, which relies on an

anonymous group of experts, who will be asked to assess possible future states (Cuhls, 2012). Such a group may consist of lead users serving as experts. The Delphi method consists of at least two rounds; in the second round, participants will receive feedback on the other experts' opinions from the first round. In order to achieve consensus, the experts have the possibility to revise their initial assessment. The Delphi method can be modified by including additional open innovation elements ("Open Delphi"), such as an Internet-based research community (Stockinger, 2015).

Another method to obtain trend-related information from lead users is through informal networking with lead users. Once identified, lead users can be directly approached at conferences or events or be contacted online via email or social networking sites such as LinkedIn, Facebook or Google+. In addition, some lead users may be active in Twitter or maintain blogs, whereas firms can follow their tweets and postings. For instance, Hanke and Möhrle (2013) have analyzed blogs as a source of information for trend identification.

4.2 Open Foresight Methods Involving User Communities and Social Networks

Communities are voluntary associations where members interact with each other to acquire and exchange information about a topic of common interest. While various types of communities exist, open innovation literature has focused on those involved in creating innovation outside the boundaries of the firm (West & Lakhani, 2008). Much information discussed and exchanged in communities is usable, accessible and even valuable for companies (Füller et al., 2006). For instance, as users articulate their general satisfaction and complaints, report bugs and problems or share ideas for improvement and novel products and features, communities can be a rich source of information for innovation and new product development. Likewise, in some communities users discuss future-related issues, which provides relevant and valuable input for open foresight. Some communities, such as

professional futurist associations or informal groups (e.g. organized via meetup.com) gather offline. However, as the Internet enables communication and collaboration between members from all over the world, most communities have an online presence.

One possibility for firms, which intend to utilize online communities as a source of information for foresight, is to rely on existing third-party communities and observe the dialogue and interactions of members taking place. This approach is referred to as netnography and was pioneered by Kozinets (1998). Initial steps of the method (Kozinets, 2002) involve formulating research questions, identifying relevant communities that are appropriate for answering this question and familiarizing with the community. Subsequent data collection includes retrieving copies of the publicly available online dialogue as well as taking field notes on observations. The data needs to be filtered in order to include only informational and on-topic information (here, future-related information is particularly relevant), and the data collection continues until a point of saturation is reached. Finally, the content retrieved from the community dialogue is analyzed and interpreted to understand the needs of community members and identify relevant trends.

Unobtrusively observing communities relates to the broader phenomenon of social media monitoring. In different social networks such as Facebook, Google+, LinkedIn or Twitter, online user interactions are recorded and stored in archives, which represent an under-exploited resource for foresight (Cachia et al., 2007). This massive amount of data from social networks, often combined with data from additional sources, is usually termed "big data" and can be analyzed to detect trends and developments with high predictive value. As Drexler et al. (2014) point out, "Big Data isn't just a description of huge amounts of data; it is about identifying and understanding the relations and correlations among pieces of information, and it's about predictions" (p. 304). Through aggregation and extrapolation of data, patterns can be recognized and, thus, changing habits und trends in social behavior be identified. For instance,

Asur and Huberman (2009) demonstrated Twitter's predictive power. While the available amount of data is increasing at fast speed, many sophisticated tools for data mining, social media monitoring and analytics are now available to help make sense of the data.

Apart from the possibility of monitoring communities and social networks, firms can become more directly involved by taking on a privileged position through sponsorship of existing communities, or through creation of their own communities (West & Lakhani, 2008). Against this background, corporate employees join interactions with community members to brainstorm and stimulate dialog on future-related issues or elaborate shared visions about how users imagine the future will look like. Hence, communities and social networks "could operate as a large-scale method for online brainstorming, a text-bed for future concepts, ideas, assumptions or scenarios" (Cachia et al. 2007, p. 1196).

4.3 Crowdsourcing Methods for Open Foresight

Another way of sourcing user knowledge for open foresight is through 'crowdsourcing'. The underlying idea is that a task, which was traditionally performed by a designated agent (usually an employee), is outsourced to an undefined, generally large group of people by way of an open call (Howe, 2006). After the problem has been broadcast, typically via a web-based platform, members of the crowd self-select to solve the problem and submit their ideas, suggestions for improvement or concrete solutions. Different approaches of crowdsourcing exist, which are also applicable to open foresight.

One type of crowdsourcing is collaboration-based, where many heterogeneous individuals work together towards a shared solution. This is common in many projects in open source software development (Lakhani & von Hippel, 2003; von Krogh et al., 2003; Belonzon & Schankermann, 2012). Another well-known example is Wikipedia, where thousands of volunteers collaborate, interact and assist each other to build the world's largest online

encyclopedia (e.g. Tapscott & Williams, 2006). Similarly, wikis and databases that are elaborated in collaboration can be used to collect knowledge for foresight. Schatzmann et al. (2013) mentions "wildcard databases, prediction databases, trend databases, databases that are used for horizon scanning and databases that are used for mapping strategic Foresight" (p. 6). One concrete example the so-called "TrendWiki", which was set up as a crowdsourcing tool for reporting weak signals of change (e.g. an interesting blog post about new innovation, an interesting aspect heard at a conference, or even just the fact that someone noticed a change in how traffic patterns are shifting) (Hiltunen, 2011). The results are shared, commented upon, refined or expanded and then the organization's foresight team meets twice a year to cluster signals into patterns and phenomena. Although the TrendWiki is designed for employees from all over the world to report weak signals, approach can also be conducted with users.

Another type of crowdsourcing is tournament-based, where many heterogeneous individuals work on a task or problem and compete for the best solution, which then wins a price. For instance, companies set up their own platforms to let a large crowd of users brainstorm for ideas, as highlighted by the case of Dell Idea Storm (Bayus, 2013). In other cases, when facing specific technical challenges, companies use the service of intermediaries for broadcast search among experts (e.g. Innocentive case in Jeppesen & Lakhani, 2008). Similarly, principles of tournament-crowdsourcing can be applied to collect information about weak signals and future information. This can be achieved for instance, through idea-spotting networks such as springwise.com and trend-hunter.com, where idea spotters can register and report their observations about ideas, innovations and startups (Hiltunen, 2011). The best ideas will be published and spotters will receive rewards for good spottings.

Prediction markets offer another crowdsourcing approach, which can be applied to diverse areas, such as forecasting future political (e.g. election results), economic (e.g. interest rates; sales), social (e.g. population development), and technological (e.g. market success of

technologies) developments. Prediction markets are web-based applications that work like traditional stock markets: Users buy shares if they expect a future event will occur, or sell shares if they expect a future event will not occur. In real time, demand and supply determine a price, which reflects the likelihood that a certain event or development will occur. The price increases as more participants believe an event or development is likely to occur and, thus, bet (real or virtual) money on it. Thereby, prediction markets collect and aggregate judgments of all participants, who feed on all available sources of information such as historical data, forecasts from other approaches, news, individual expectations (Graefe et al., 2010).

Finally, an emerging approach are collaborative forecasting games, which invite a crowd, often several thousands of players, to imagine how certain futures would look like (Schatzmann et al. 2013; Rau et al., 2014). The Institute for the Future (IFTF) has developed the "Foresight Engine" platform to set up games, which simulate different future realities: e.g. a future threatened by "superthreats" (such as in the game "Superstruct"), a future of energy (game "SmartGrid 2025") or a future of health care provision systems (game "Future of hospitals"). Players immerse themselves in these scenarios through e.g. YouTube videos and information made available through Facebook, blogs and wikis. In the tradition of brainstorming, players are encouraged to submit their ideas about the future, and, when others build on these ideas to form chains of discussion, they earn points, awards, and achievements for winning ideas[1]. By aggregating numerous micro-forecasts, a big picture emerges of how the future will possibly look like.

5 Comparing Open Foresight Methods

The previous section has provided an overview of possible approaches for implementing open foresight with users and user collectives. On this basis, the present section describes

[1] see webseite: http://www.iftf.org/what-we-do/foresight-tools/collaborative-forecasting-games (accessed: 12.02.16)).

corresponding advantages, disadvantages as well as boundary conditions. The discussion is structured along four key design dimensions according to which methods differ. First, available methods differ regarding the number of involved users, i.e. they use knowledge from individuals or from a collective. Second, methods vary regarding the mode of interaction, as they rely either on active cooperation, unilateral sourcing of knowledge or passive observation. Third, methods (except passive methods) differ with regard to the degree of control they leave a company to influence activities and can also be subdivided into self-organized or more directed forms of governance. Fourth, methods (except passive methods) rely on different incentives to motivate users to contribute to foresight, with both intrinsic and extrinsic motivations existing.

5.1 Individuals' Knowledge vs. the "Wisdom of the Crowd"

First, available foresight methods can be distinguished from one another as to the number of involved users, i.e. methods rely either on the sourcing of knowledge from individuals or the knowledge from a collective, i.e. a group or crowd of users.

When a firm decides to tap the rich source of user knowledge, one possible approach is to involve individual users. While typical users are constrained by their present real-world experience, lead users encounter needs significantly earlier than the mainstream. Thus, lead users are particularly qualified to act as experts in open foresight. Just as the lead user method relies on the integration of selected individuals, a limited number of previously identified lead users can be invited for participation in open foresight workshops (Rau et al., 2014). In this context, traditional foresight methods can be applied, i.e. the firm is not required to make significant adjustments to its current foresight practice. However, preparing a workshop and bringing together all participants in one place is time-consuming and requires a significant investment of human and financial resources (Lüthje & Herstatt, 2004). As alternative to

having lead users participate in workshops, firms can source their future-related information through interviewing, networking or using social networks to connect and follow. But still, the number of users with whom the firm establishes contact should not get too big, as "maintaining too many relationships is costly and may lead to a diversion of managerial attention" (Dahlander & Gann, 2010, p. 706). At some point, when the number of experts gets too large, the benefits of integrating external sources may be offset (Wallin & von Krogh, 2010). In addition, the identification of lead users, who are both knowledgeable and motivated to join foresight activities, is not trivial and remains a challenge. There is also a risk of a selection bias existing, if a firm tends to select lead users, who share their views and, thus, hinders the detection of blind spots.

In contrast, firms can tap the vast pool of knowledge available within a user collective, such as a community or crowd. The Internet and modern information and communication technologies enabled the participation of a large number of people independent of their physical location. As a result, the potential of searching for input from external sources increased and the costs decreased (West & Bogers, 2013). Through community and social network-based and crowdsourcing approaches or by conducting Delphi with lead users as experts, these technological advances are utilized to source knowledge from a huge number of people. They thus harness the "wisdom of the crowd", which implies that the group or crowd makes more accurate decisions - or, in this context, better predictions - than an isolated individual, no matter how smart or well-informed he or she is. Surowiecki (2004) examined the requirements that are necessary to facilitate the wisdom of the crowd and found that diversity is central, as each person has different pieces of information. Given that all individuals in the diverse and large enough crowd are decentral and decide independently, individual pieces of information can be aggregated such that the resulting crowd opinion is more than the sum of its parts. Since these methods do not require the identification of knowledgeable users, but let the participants self-select, selection bias is avoided. Moreover,

utilizing information and communication technologies, these methods tend to be of high value but low cost. Despite these advantages, sourcing knowledge from a group or crowd of users is not the means appropriate for problem solving in any circumstance (Afuah & Tucci, 2013). For instance, crowdsourcing is appropriate if problems are new, complex, and ill-defined (because underlying information or interrelations are difficult to access) and require a substantial amount of creativity or transfer of analogous knowledge. In contrast, crowdsourcing is a less appropriate mechanism when a "problem is too tacit to be delineated and broadcast or requires a considerable amount of interaction between the seeker and the solver" (Afuah, 2014, p. 75).

5.2 Active Participation vs. Passive Observation

Second, open foresight methods vary significantly as to how the organization interacts with the environment. Methods rely on active cooperation, unilateral sourcing of knowledge, or passive observation.

Interactive methods directly integrate the holder of information, i.e. the user, into the foresight process to collaboratively explore possible alternative futures. In this context, interaction between the organization and users is characterized by direct communication and reciprocal exchange. Often, such interaction takes place in face-to-face workshops where participants are given the opportunity to express their thoughts and discuss them with each other. Workshop participants give and receive immediate feedback and build on each other's insights and arguments, so that interaction leads to a self-reinforcing effect of cooperation among actors with different knowledge, skills, and experiences (von Hippel & Tyre, 1995; Franke & Shah, 2003). Moreover, workshops allow for efficient communication between the organization and users, because the immediate interaction provides room to clarify comments and avoid, or at least reduce, misunderstandings and misinterpretations (Rau et al., 2014). Collective creativity

flourishes when individuals actively interchange thoughts and expressions, but, originally, such creative environment was only found in a close physical environment (Cachia et al., 2007). Today, favorable conditions for interaction can also be found in online communities where members communicate and exchange their arguments in real-time. A possible disadvantage of interactive methods is, however, that "the personal integration might support psychological group effects such as groupthink, leading to a conformity of opinions" (Rau et al., 2014, p. 30).

A second type of methods relies on the unilateral sourcing of user knowledge. The organization thereby integrates solely the information artifact, but not the person holding the information (Diener, 2014). As neither mutual exchange nor deeper interaction are intended, the role of the user is limited to giving input. Typically, organizations first specify what kind of future-related information they need. Then, the organizations turn to the users, often using one-to-many and automated communication. For instance, organizations specify their problem, or what kind of information they look for, and invite users through an open call to participate in crowdsourcing tournaments. Users then self-select and submit their solutions and ideas. Afterwards, the input provided by users will be assessed internally and used for in-house foresight purposes. Moreover, organizations can interrogate users by means of interviews or surveys, or use prediction markets to let users bet on the likelihood of possible future events.

Moreover, some methods are available that allow organizations to passively obtain future-knowledge from users. The role of the user is confined to being an observee, as there is no exchange, communication or interaction at all. Instead, these methods rely solely on observation of online user dialogue and postings, which are generally available publicly in communities and social media. For instance, firms can screen tweets and blog entries of lead users or analyze data retrieved from social networks or online communities to systematically

identify future-related information. One advantage of these methods is that increasing amounts of such data are publicly available and can often be accessed at no cost. Kozinets (2002) has pointed out that the strength of netnography lies in its unobtrustive nature, which provides a source of unbiased customer opinions. This argument can be generalized to all mentioned passive open foresight methods. On the other hand, the unobtrusiveness gives rise to ethical concerns about monitoring people's behavior without their consent (Kozinets, 2002). Moreover, while information can be retrieved at low cost, a high effort and investment may be required for protecting the privacy and confidentiality of users.

5.3 High Level of Control vs. Self-Organization

Third, interactive and unilateral sourcing methods differ as to the degree of control they leave a company to manage and maintain control over the direction of activities taking place. Thus, one may differentiate between self-organized or more directed forms of governance. This classification does not apply to passive methods: Online dialogue and expressions are observed, but are not influenced so that no governance of user behavior takes place.

When firms involve external sources into their innovative activities and invite volunteer users to contribute their knowledge, they cannot apply traditional organizational hierarchy or leadership authority to directing, incentivizing, or monitoring volunteers' efforts (Wallin & von Krogh, 2010). Many open innovation methods, which can also be applied to foresight, rely on the self-organization of users. This particularly applies to community and social network-based approaches or collaboration-based crowdsourcing, which are essentially characterized by broad participation and self-determined collaboration of users. Using the example of Wikipedia, Cachia et al. (2007) point out that, when contributors act within a well-structured framework, they can gain control of objectives with minimal infrastructure and monitoring and are able to cope with diversity, controversy, and inconsistency. A

disadvantage from the firm's perspective is, however, that communities tend to take up problems of interest to them, giving firms only limited leeway to select, propose and effectively broadcast specific problems (Felin & Zenger, 2014). In contrast, in tournament-based crowdsourcing, firms can clearly specify their problem and the types of input they seek. The organization defines the terms (e.g. duration of call, evaluation criteria), then the users self-select to participate and submit solutions, suggestions and ideas. After the tournament deadline, the organization assesses the submissions and offers a reward to the user with the best contribution. However, while self-selection is assumed to attract suitable participants, the seeking firm has no direct control over the selection of participants (Afuah, 2014).

In communities, the degree of control depends largely on the firm's role. A higher level of control to guide the activities of users towards achieving firm-level objectives can be exerted if the organization assumes a privileged role (West & Lakhani, 2008). As long as a firm uses a platform owned or maintained by third parties, it never has the same amount of control as in case of a proprietary platform (Dubiel et al., 2014). If the firm creates its own platform, it has more power to control membership and circumvent risks. On the other hand, if a firm exerts too much control, users may withdraw from the community, which will destroy the productive setting. While a firm may be tempted to control the work of voluntary contributors by demanding higher productivity, this may weaken people's motivation to contribute out of fun, learning, or recognition (Wallin & von Krogh, 2010). The governance structure influences the level of contributions, and it has been found that the more open a project is, the more emphasis needs to be put on a 'fair" governance structure (Shah, 2006). Further methods involving more directed forms of governance include workshops with lead users.

5.4 Intrinsic vs. Extrinsic Incentives for Participation

Fourth, methods rely on different incentives to motivate users to contribute to foresight and freely reveal their knowledge. Both intrinsic and extrinsic motivations may come into play. Again, this classification is irrelevant for passive methods, where users are typically unaware of being observed.

A general issue in open innovation is the circumstance that knowledgeable individuals work outside the company and that less powerful incentives are available to motivate them (Wallin & von Krogh, 2010). A particular challenge, which also affects foresight, is therefore to incentivize participation of users and keep up their interest and motivation. Some methods rely predominantly on the intrinsic motivation of users. For instance, users, who are active in communities and social networks or contribute to collaboration-based crowdsourcing, are strongly motivated by the interest in certain topics and enjoy social exchange and discussion with peers about their topic of interest. In order to preserve the contributors' motivation, Hiltunen (2011) highlighted (in the case of Finpro's crowdsourced TrendWiki) the importance of giving feedback to contributors. Another intrinsic motivation is fun, which plays an important role in collaborative forecasting games that incentivize users to participate by entertaining them (Schatzmann et al., 2013). Gamification holds potential to particularly get those individuals involved, who have not yet dealt with foresight or are not interested in future-related issues (Watkins & Neef, 2016).

In methods, which involve lead users, the potential use of a novel solution that caters to their needs provides a strong incentive for revealing information and contributing to innovative activities. Although foresight does not aim at the development of new products and services in the short run and the innovation-related benefit may be weaker, it is still relevant to motivate lead users to share their future-related knowledge. Lead users might feel honored to participate or simply enjoy the creative task (Lühtje & Herstatt, 2004). However, if intrinsic

motivation does not suffice, additional monetary incentives can be used to extrinsicially motivate them to cooperate with the firm in foresight workshops and compensate for their efforts. Further methods, which rely on a mix of intrinsic and extrinsic motivations, include tournament-based crowdsourcing: While non-monetary factors continue to play a role, a price is announced to reward the winning solution or idea and, thereby, incentivize users to participate. A strong financial incentive is at work in prediction markets, where users are incentivized to participate and reveal information as they expect to win money for successful forecasting and trading performance. Graefe et al. (2010) highlight that prediction markets trick participants to continuously challenge the group opinion and look for superior information, as participation is only beneficial if one does not agree with, and is able to improve, the current forecast.

In addition to intrinsic and extrinsic motivations, Franke et al. (2013) found that, apart from potential participants calculating whether participation will pay off, there is also a subjective evaluation of fairness. Accordingly, the individual's propensity to submit a contribution increases when they get a fair share and have a voice in decisions.

6 Conclusion

Advances in information and communication technologies have facilitated new methods to source knowledge beyond organizational boundaries. Many of these methods known from open innovation can also be applied to foresight to source knowledge from external sources. This article discussed at first, which competences and specific knowledge users possess and how their integration can potentially enhance foresight results. Afterwards, the paper provides an overview of methods, which can used to tap knowledge from users and user collectives. Finally, the methods were described and compared in more detail along four key design dimensions.

Open innovation has induced a paradigm shift (Baldwin & von Hippel, 2011), which is now also affecting foresight practice. Similarly, foresight methods will increasingly rely on knowledge of external actors and thereby develop into a more open direction. It appears that the expertise of a limited number of individuals, such as experts, loses influence in favor of collective intelligence. Cachia et al. (2007) highlight a change in trust patterns: "While, some years ago people would only trust reputable encyclopedias written by experts acknowledged in their respective fields, now people are also confident in the collaborative work of anonymous contributors" (p. 1190f.). Moreover, increasing amounts of user dialogue available online are being analyzed for foresight, which will lead foresight to become more data-driven.

The methods discussed in this article have different strengths and weaknesses and the selection of a suitable method depends on the firm's specific objectives. In addition, these methods often supplement each other and can be combined. For instance, an online community can be used to post an open call for participation in crowdsourcing tournaments or prediction markets. Another example refers to the identification of lead users in social networks and communities (Belz & Baumbach, 2010; Brem & Bilgram, 2015) or prediction markets (Spann et al., 2009), which are then invited to discuss possible alternative futures with internal employees face-to-face in foresight workshops.

Little research on open foresight has been conducted yet. More research is needed to investigate under which conditions methods work best. Moreover, in the context of open innovation, West and Bogers (2013) pointed out that the identification and acquisition of innovations is only one part and that, in order to benefit from external sources, the innovations must be fully integrated into the firm's R&D activities. A similar issue applies to foresight, as foresight is not just about developing visions about possible alternative futures, but also using the knowledge to take the right action.

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Paper III:
Business Incubators and Accelerators: A Co-Citation Analysis-Based, Systematic Literature Review

Piet Hausberg; Sabrina Korreck

Abstract:

A long and rich research tradition exists on the phenomenon of business incubators since this kind of venture support institution first emerged. One can observe an increasing heterogeneity of incubation beyond the traditional mainstream focus on regional development and university-based incubators. In the last decade, in particular the phenomenon of accelerators as a particular form of incubators received increasing research interest. A few literature reviews started summarizing the field, but left some important issues unanswered. This systematic review study contributes to this effort deriving current themes and a research agenda. We find that open innovation and social capital theory increasingly complement the resource-based view as frameworks to understand business incubation. Moreover, the phenomenon of private corporate incubators and accelerators gains traction, both in entrepreneurship theory and practice.

Keywords: Business incubators, Accelerators Technology incubators, New technology based firms, Systematic review

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1 Introduction

The concept of business incubation experienced a considerable evolution and division into several similar institutions and approaches (Mian et al., 2016). After the first private incubator was established in New York in 1959 (Lewis, 2001) and the first public incubator in Philadelphia in 1964 (Campbell & Allen, 1987), business incubation diffused slowly during the 1960s and 1970s (Hackett & Dilts, 2004). By now, incubators have become an integral part of the modern entrepreneurial ecosystem, supporting the growth of new ventures based on a broad range of measures. In fact, we saw the emergence of so many different forms of entrepreneurship support and even more names for them that the result was a significant degree of confusion regarding the terms incubator and accelerator and their delineation from and relation to connected concepts. A result of the evolution of the incubator industry, the forking of its development paths and experimentation with new incubator business models, is that no universal definition has crystallized and that both practitioners and scholars often use similar concepts synonymously.

While there is a considerable history of research on incubators, literature appears to remain fragmented and incubators have long been studied mostly as a peculiar phenomenon in a variety of closely related research streams, above all urban and economic development and university-industry technology transfer. Only recently, research focusing primarily on the phenomenon of business incubators themselves gained traction. We identified a few recent bibliometric and review studies regarding the field of business incubation in general (Albort-Morant & Ribeiro-Soriano, 2016; Hackett & Dilts, 2004; Mian et al., 2016; Phan et al., 2005) and one such study regarding university incubators in particular (McAdam et al., 2006). Each provides some important insights into and overviews of the topic, but at the same time leaves some equally important questions unaddressed. Probably the first review of the literature on business incubation is that of Campbell and Allen (1987). At the time, the phenomenon of

incubators was very recent and hence the research field only embryonic. Consequently, there was little need for the review to be very systematic; it still succeeded to provide an in-depth summary of the very few books and articles available.

Most recently, Albort-Morant and Ribeiro-Soriano (2016) carried out a bibliometric analysis and provide us with insights on the most productive authors, the development of the number of publications over time, the geographical distribution of research in the field, the journals with the most publications and received citations, as well as the type and area of research. However, while undoubtedly useful, bibliometric analyses and their metrics can—if not supplemented by an in-depth review—provide only a first glance at the status quo of the field. Hence, we learn little about theoretical frameworks used or new concepts introduced. Mian et al. (2016), introducing to their special issue on business incubation, provided the most recent literature review. They show a growing interest in the topic and point to the phenomenon of accelerators as a newly emerging, relevant phenomenon for which only very limited research exists.

A more comprehensive study is the systematic literature review by Hackett and Dilts (2004) in this journal. In their careful review, they provide a very good overview of the development of the field in terms of the incubator definitions and configurations, the key findings regarding incubation process and impact, and the challenges that the literature stream faced at the time. However, this review dates back over a decade and we clearly witness the emergence of new empirical phenomena and theoretical developments.

This overview of extant review studies shows that reviews either are at least a dozen years old or are limited to bibliometric analyses. Therefore, our systematic literature review aims at pursuing four distinct goals. First, we seek to show the recently consolidating research field regarding business incubators in the network of the most relevant adjacent fields and topics. Second, we intend to derive a most reconcilable definition of the concept of business

incubators. Third, we aim at summarizing the state-of-the-art research. Fourth and finally, we pursue the overall goal to conclude the implied persistent research gaps in order to suggest a research agenda.

In the following section, we describe our research design before we present the results of our bibliometric analyses in the subsequent section. After that, the main part of the review covers definitions and typologies of incubators, their processes, as well as research on their performance and impact. From this, we derive research gaps before we conclude with an outlook on future research.

2 Research Design

In our study, we carried out a systematic literature review that provides a bibliometric and co-citation analysis, similar to the review of entrepreneurship research in general carried out by Schildt et al. (2006). Before we started the actual systematic review, we scanned and read some of the most salient articles in the field in order to determine the search term. Then we used the ISI Web of Science (WoS) database to find all literature on the topic that could be of interest. When using the 'topic' field to search the database, ISI-WoS returns all articles with the search terms in their title, keywords, or abstracts. Scholars in management science consider this database the most comprehensive and use it frequently in systematic reviews (Albort-Morant & Ribeiro-Soriano, 2016; Dahlander & Gann, 2010; Mian et al., 2016). However, although the ISI-WoS database is one of the most comprehensive scientific journal databases, it is not exhaustive. The sample could therefore miss some important contributions. Moreover, we decided to focus on the most high-ranking journals (see Figure 1). This also means that the initial sample for the co-citation analysis does not include books, although some provide relevant contributions. However, most of these are included later because

relevant papers cite most of the relevant papers and books initially not included and hence they appear at least once in our sample.

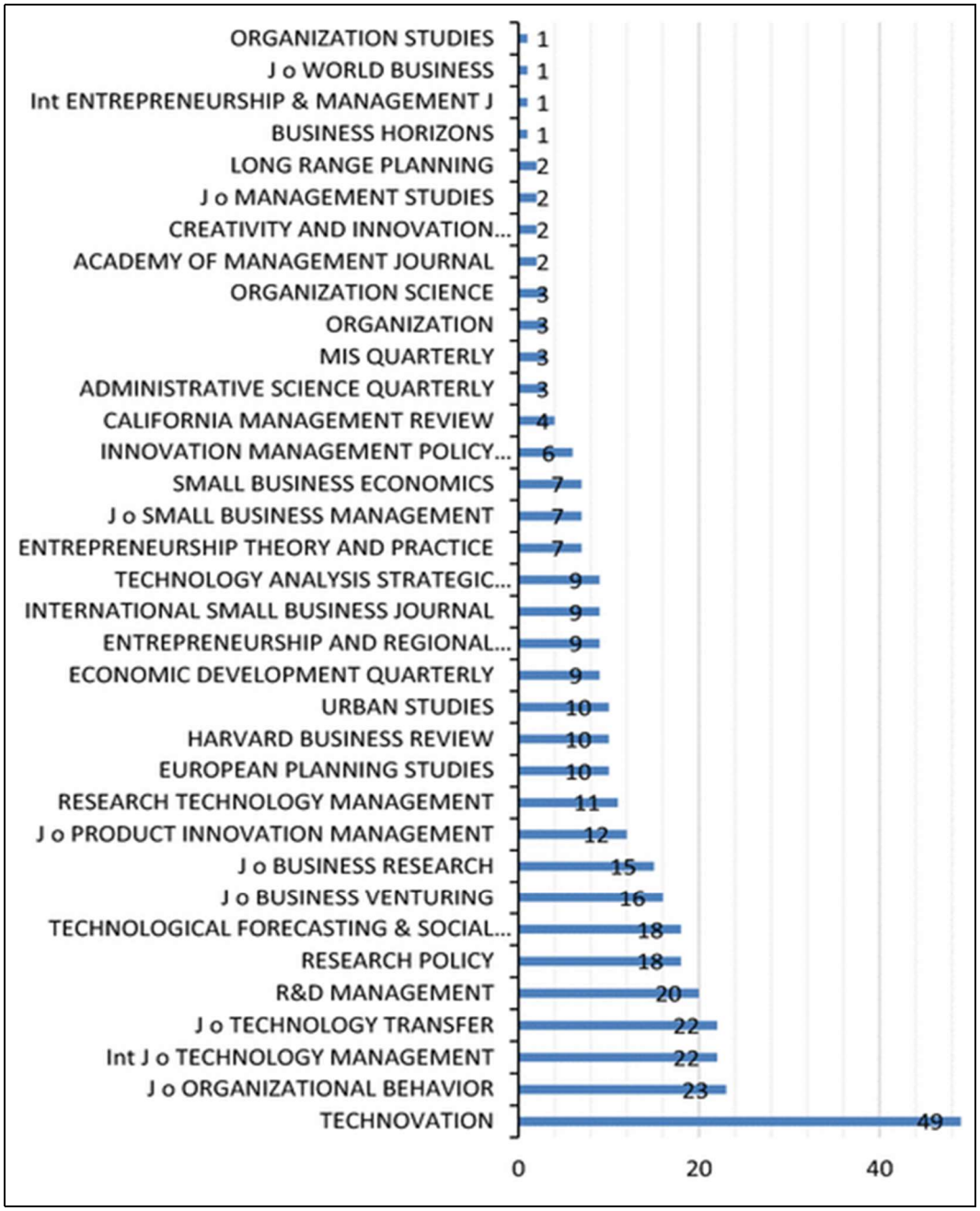

Figure 1: Number of publications in our sample/Journal

Our broad search term was as follows: <“incubat*” OR “business accelerat*” OR “technology accelerat*” OR “company builder*” OR “technology cent*” OR “innovation cent*”>. We included the terms company builder and technology/innovation center, because we wanted to reduce the probability to miss relevant literature due to a too limited search. We used the

asterisks in order to retrieve results for similar versions and alterations of the terms, like incubation and incubators. We decided not to search for "accelerat*" without business or technology, because this search turned out to deliver a huge number of false positives even in the most pertinent journals, for example, when high-dynamic business environments are investigated and a factor "accelerates" business processes.

We combined the search terms with the constraint that it has to appear in one of the following WoS-categories: *management, business, economics, operations research, management science,* or *urban studies*. By this restriction, we could exclude more than 240,000 items from other disciplines such as health care, engineering, or physics. Based on this initial macro-filter, the WoS database returned 601 results. In the second step, we screened the journals for which the search returned at least one article and restricted the search to the journals that could contain relevant articles, which led to a sample comprising 353 articles. In the third step, we screened all returned articles of journals that were not amongst the obviously most relevant journals in order to identify false positive results. Following this screening, we could restrict our journal list even further and ended up with a final sample size of 347. On this sample, we performed the bibliometric analysis discussed in the next section (Figures 2, 3 and (Table 1).

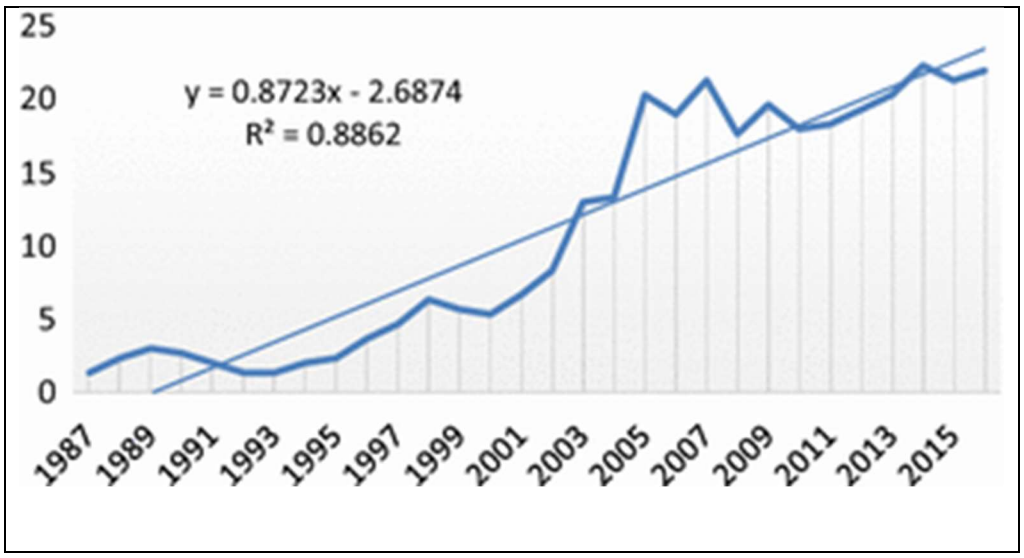

Figure 2: Three-year smoothed publication count and corresponding polynomial trendline

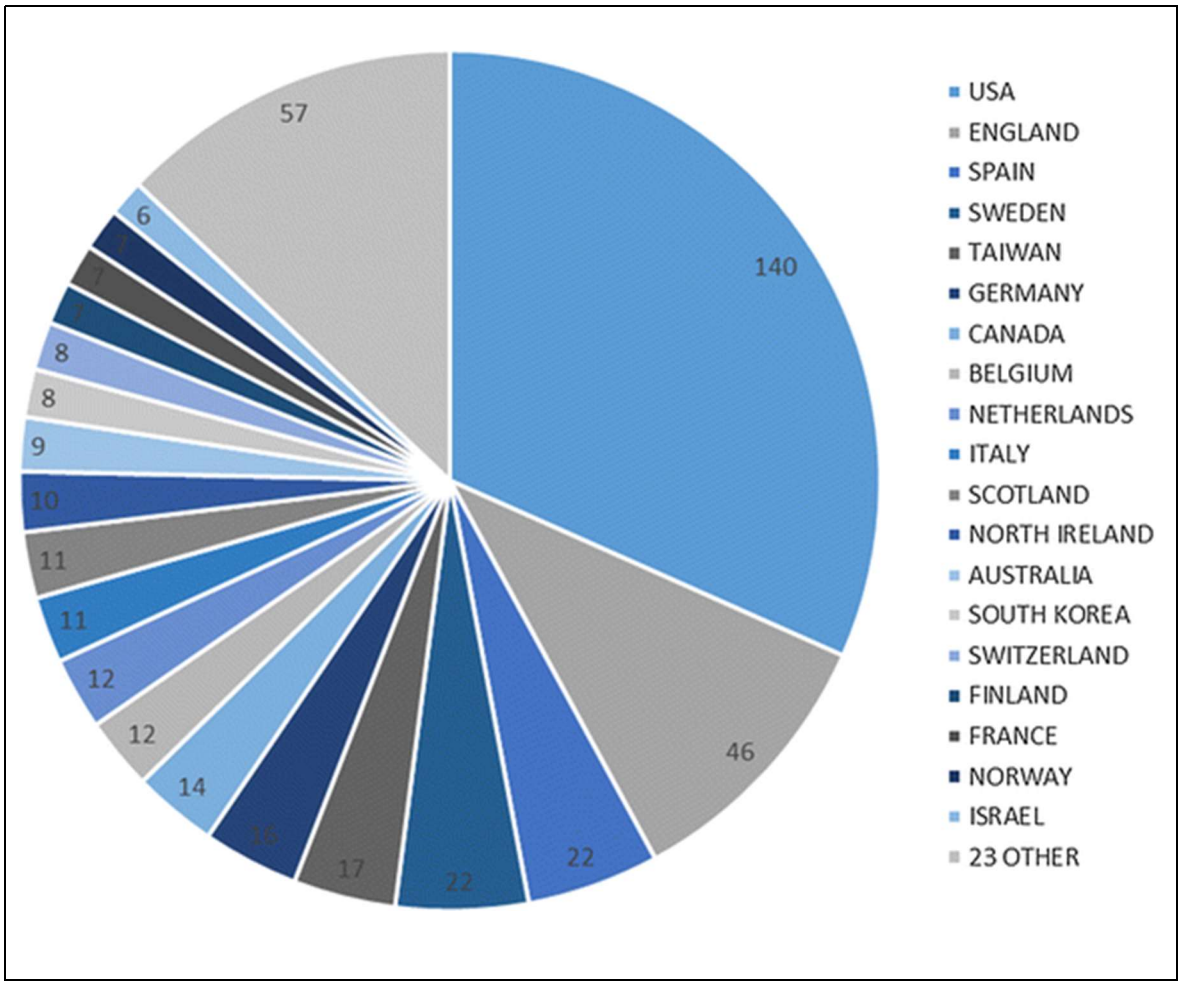

Figure 3: Research by country (more than one country/article possible)

Sum of the Times Cited:	22286
Sum of Times Cited without self-citations:	21046
Citing Articles:	17254
Citing Articles without self-citations:	16963
Average Citations per Item:	27.72
h-index:	73

Table 1: Citation statistics

3 Overview of Bibliometric and Co-Citation Analysis Results

Using the freeware online tool *hammer.nailsproject.org* we conducted a bibliometric analysis and obtained the co-citation node-edge-files. Afterwards, we imported the data to the *Gephi*

0.9.2 software for the co-citation analysis and visualization of the co-citation network. The assumption behind co-citation analyses is that with an increasing number of shared citations the probability increases that focal papers share a specialized language and specific worldview (Boyack & Klavans, 2010). This allows us to conclude that co-citation clusters treat the topic of interest from a similar perspective and with similar argumentative backgrounds and patterns.

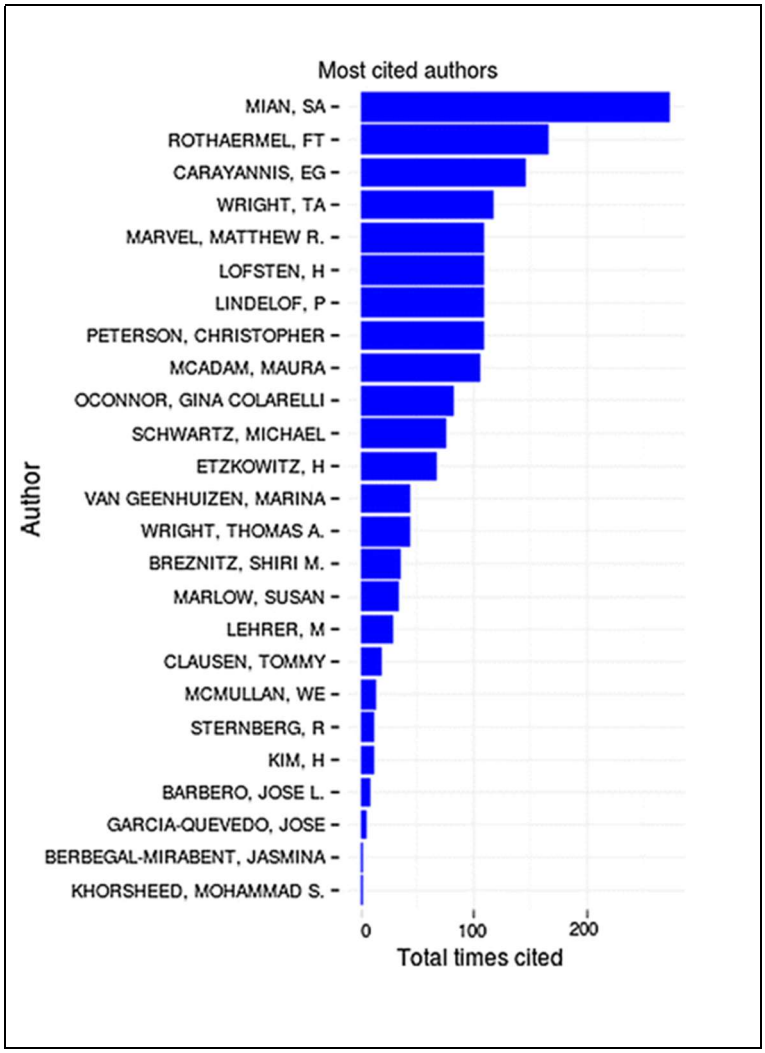

Figure 4: Most cited authors

Authors occasionally make errors in citations—above all in the articles before the introduction of citation management software. Thus, we had to screen manually all 11,835 nodes of our nodes table for duplicates. Each duplicate receives only a fraction of the actual citations, leading hence to a severe underestimation of the cited work. Their consolidation is

therefore fundamental. Indeed, we found 337 nodes that appeared several times in the table. In many cases, these multiple entries referred to books with different editions over the years. In other cases, authors were included with different versions of their names, e.g. either with both their given names abbreviated or with only the first name without abbreviation Figure 4. We also found several typos in the volume or year number of journal articles. The entire number of deletions of duplicates amounted to 481 because several entries exhibited multiple different versions. The final number of nodes of the co-citation network hence amounted to 11,354. We filtered out all entries that received only one citation (i.e. in-degree ≥ 2). This reduced the network to a size of 1821 nodes (16% of the total network) with 2842 edges, a diameter of 7, and an average path length of 2.3.

Our co-citation analysis revealed seven clusters: (1) business incubation, (2) science parks and university-based incubators, (3) social and knowledge capital view on incubators, (4) new technology-based firms and science parks, (5) technopolis, (6) evaluation, and (7) survival and failure of incubatees (see Table 2 and Figs. 5, 6). While studies in cluster (1) focus primarily on business incubators, the clusters (2–7) show the most relevant research areas that overlap with the research on business incubators. Hochberg (2016) divided research on accelerators roughly into two categories: conceptual description of the accelerator model and empirical accelerator impact assessments. Hackett and Dilts (2004) divide literature into five periods of incubator research, namely in chronological order (1) incubator development studies, (2) incubator configuration studies, (3) incubatee development studies, (4) incubation impact and (5) incubation theory studies. While we agree with Hackett and Dilts (2004) that a slightly more fine-grained distinction between research streams is due, we do not fully agree with their chronological categorization. Based on our review of the papers we analyzed, we find that it is useful to distinguish between the following three streams: (1) studies on origins, definitions and typologies of incubators, (2) studies on the incubation process, and (3) studies

on impact and performance. Studies that address issues of definition and characteristics of incubators make up a considerable share of the relevant literature.

Cluster	Reference	InDegree	Closeness	Betweeness
1 Business Incubation Core Literature (green)	Mian (1996)	30	1	1.69E-04
	Mian (1997)	26	1	3.12E-04
	Rice (2002)	17	1	5.24E-05
	Aernoudt (2004)	16	1	1.39E-05
	Autio & Klofsten (1998)	11	1	3.29E-05
	Sherman & Chappell (1998)	9	1	2.00E-05
	Carayannis (2005)	7	1	2.48E-05
	Udell (1990)	5	1	2.48E-05
	Bollingtoft and Ulhoi (2005)	14	1	1.85E-05
	Colombo & Delmastro (2002)	22	0.6963	2.48E-04
	Grimaldi & Grandi (2005)	15	0.6806	1.85E-04
2 Science Parks & UBIs (blue)	Clarysse et al. (2005)	14	1	1.02E-04
	Markman et al. (2005)	8	0.8077	1.37E-04
	Phan et al. (2005)	17	0.6337	2.23E-04
	Perez & Sanchez (2003)	4	0.617	4.00E-05
	Rothaermel & Thursby	7	0.5371	1.15E-04
	Kroll (2008)	1	0.4744	1.31E-05
	Rothaermel & Thursby	13	0.4607	1.80E-04
	Lockett (2005)	4	0.4559	2.80E-05
3 Social and Knowledge Capital View of Incubation (red)	Carayannis et al. (2006)	3	1	3.31E-05
	Collinson & Gregson (2003)	2	1	1.06E-04
	Tsai, Hsieh, Fang, & Lin (2009)	1	0.7901	1.26E-05
	Hughes et al. (2007)	4	0.6457	4.47E-05
	Becker & Gassmann (2006)	1	0.5232	7.50E-06
	Tötterman & Sten (2005)	10	0.4769	9.69E-05
4 New Tech-Based Firms in Science Parks (yellow)	Feeser & Willard (1989)	1	1	1.13E-05
	Lofsten & Lindelof (2001)	9	0.6809	3.96E-04
	Lofsten & Lindelof (2003)	2	0.5873	1.08E-04
	Lindelof & Lofsten (2003)	2	0.5556	5.25E-05
5 Technopolis (light green)	-			
6 Tech. Centers & TTOs (orange)	Luria & Wiarda (1996)	1	1	3.02E-07
7 Venture Survival (dark green)	Peña (2004)	6	0.575	7.48E-05

First dozen publications of each cluster that have closeness centrality above 0.4. AND in-degree at least 1.

Table 2: Most central articles in co-citation network by cluster

4 Review and Summary of the Three Major Research Topics

4.1 Definitions and Typologies of Incubators

There is definitely no scarcity in definitions of incubators. Already 40 years ago, Kuratko and LaFollette (1987) recognized a growing problem defining the concept: “The task of defining

what is meant by an incubator has become difficult since the original concept is being adapted to fit the needs of the economic areas." (p. 49). In fact, both scholars and practitioners have put forward a plethora of definitions of many similar types of incubators. Adding to the confusion, many concepts evolved before and during the development of the incubator concept and exhibit sometimes a considerable overlap and proximity.

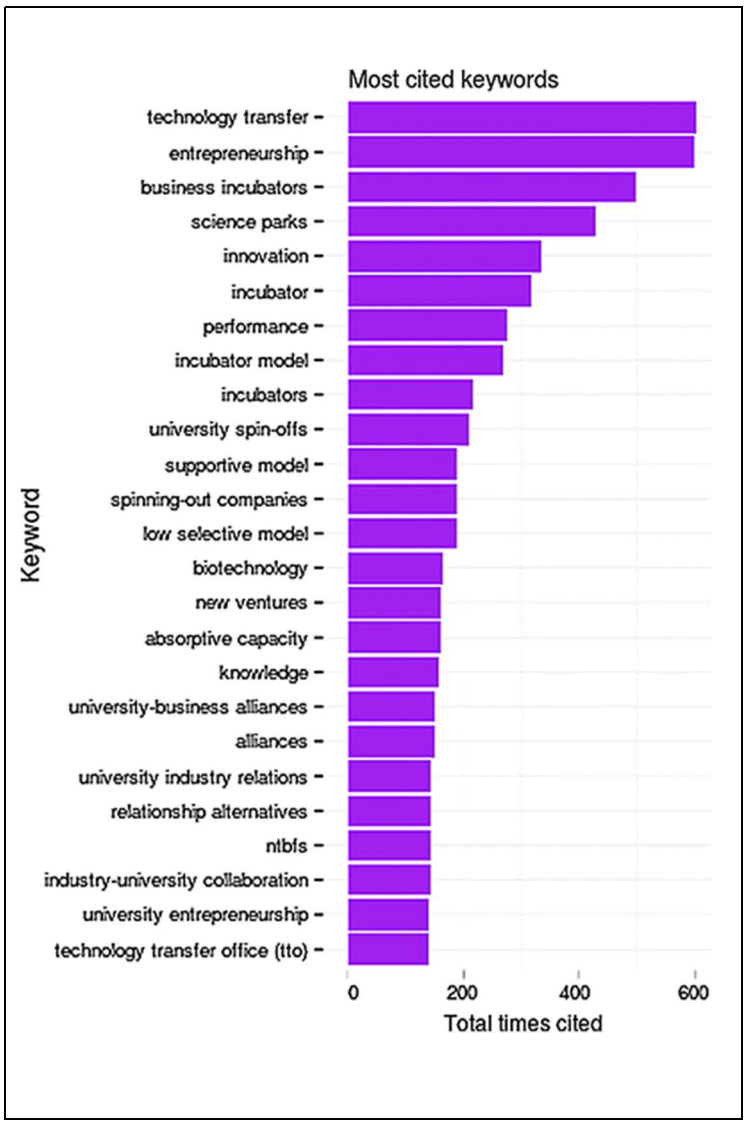

Figure 5: Most cited keywords

The organizations and institutions of today's entrepreneurial ecosystems (Spigel, 2015) are very heterogeneous. Most recently, private independent or corporate for-profit incubators emerge and usually have a focus on start-ups in the ICT and other high-tech sectors (Aerts et al., 2007; Becker & Gassmann, 2006; Hackett & Dilts, 2004). This new breed of incubators

put stronger emphasis on the provision of direct access to capital and specialized services in order to speed up the startups' time-to-market and to bring start-ups into a common network with technological and commercial big players (Grimaldi & Grandi, 2005). Large established companies often face difficulties in fostering radical innovation (Christensen, 1997), for example due to organizational inertia or conflicting organizational norms and structures (Hannan & Freeman, 1984; Tushman & O'Reilly, 1996). Hence, firms increasingly try to overcome these difficulties by collaboration with startups through their own corporate incubators and accelerators. In the literature on corporate entrepreneurship, approaches have been identified that resemble what could be called a corporate incubator without bearing that name (Wolcott & Lippitz, 2007). These corporate incubators provide most of the services traditional incubators or accelerators provide, but aim at encouraging and helping their own employees to create new business that may then become new business units or spin-offs. The corporate incubator of Phillips has been described as an early example of this kind of corporate entrepreneurship (Ford et al., 2010; Wolcott & Lippitz, 2007). However, Ford et al. (2010) describe the Phillips technology incubation program rather as an effective simulation of the venture capital approach than of the business incubator approach. Meanwhile, corporate incubators leveraging external ideas and entrepreneurs increasingly complement (or substitute) these inward-focused ones (Kohler, 2016). Corporate incubators hence are means of both outside-in and inside-out open innovation in corporate entrepreneurship (Weiblen & Chesbrough, 2015).

Understandably, hence, scholars have not yet settled on a single definition of an ideal type incubator (Albort-Morant & Ribeiro-Soriano, 2016). Some studies investigate several of these concepts as a whole and compare them, e.g. science parks and incubators (Ratinho & Henriques, 2010) or incubators, technology centers, and universities (Roig-Tierno et al., 2015). Incubators target ventures, which are in their early development stages, so that the term incubator should not be used interchangeably with the terms science park or technology park,

which are generally designed to support more mature firms (Bergek & Norrman, 2008). This shows that the definition should not be too narrow since otherwise the immense number of similar concepts would increase even further.

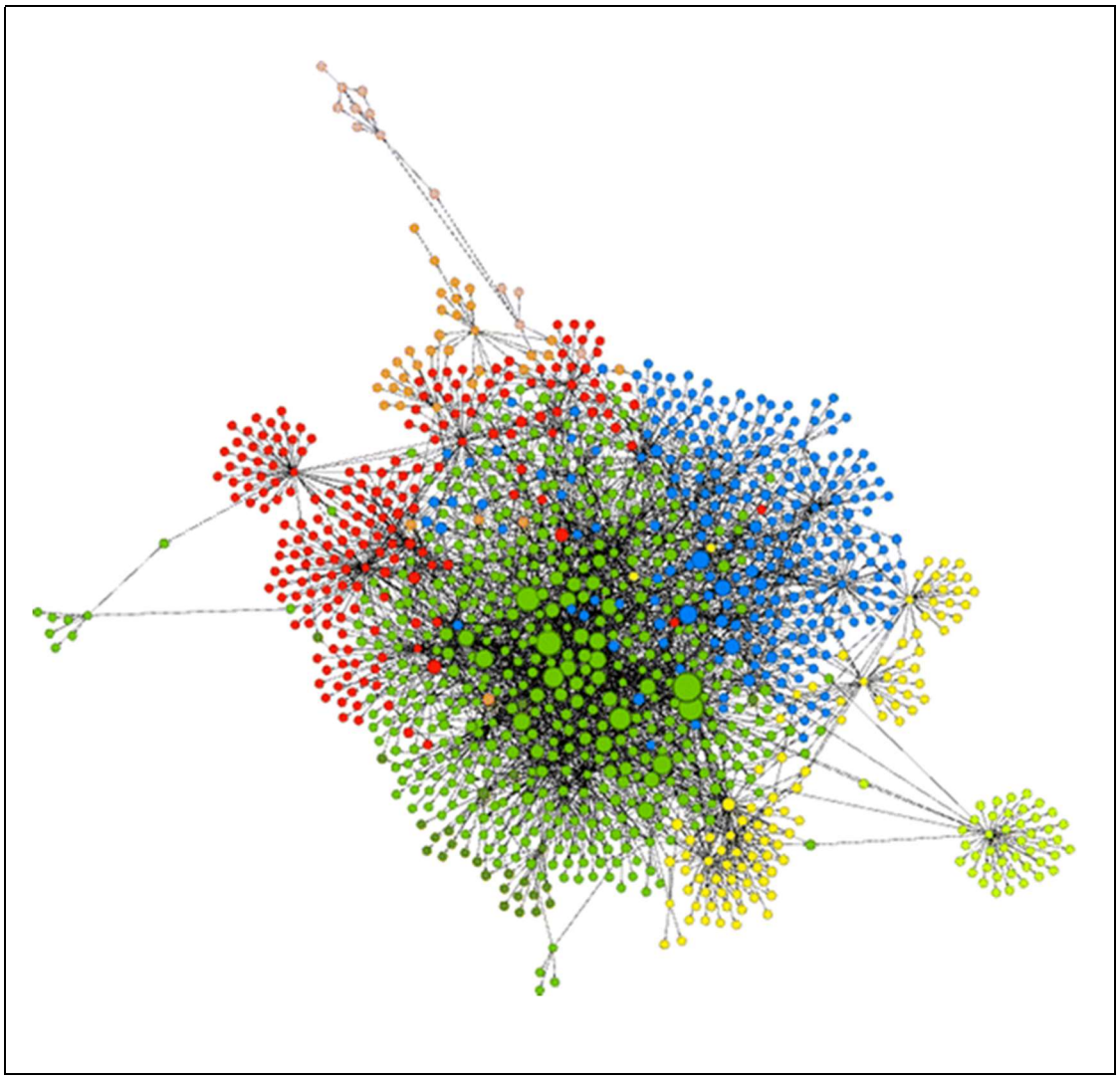

Figure 6: Largest connected component (node color by cluster; node size by in-degree)

If the definition is too broad, however, it risks including substantial aspects of what research investigates as organizational entrepreneurship. In fact, Cooper (1985, p. 76) notes: "Every organization might be viewed as a potential incubator, influencing its employees in a variety of ways that make them more or less likely to leave and start new firms." A narrower definition allows the distinction of classical business incubators from other forms of business incubating-organizations like accelerators. Accelerators usually are fixed-term, cohort-based

programs providing education, monitoring, and mentoring to start-up teams (usually not single entrepreneurs) and connecting them with experienced entrepreneurs, venture capitalists, angel investors and corporate executives and preparing them for public pitch events in which graduates pitch to potential investors (Cohen, 2013; Cohen & Hochberg, 2014; Hochberg, 2016).

We found a broad range of broader and narrower definitions of incubators in the literature we reviewed (see Table 3). While for a long time the physical collocation of incubatees has constituted a central defining characteristic of business incubators, this feature is lacking in some more recent definitions due to the increasing focus on counseling and support services and the advent of virtual business incubators. On a most fundamental level, definitions of incubators refer to these as projects, tools, facilities, buildings, enterprises, organizations or most broadly institutions. Defining business incubators as organizations or institutions is broad enough to include both public and private incubators, but defining them as organizations rather than institutions emphasizes that they are actively managed. Moreover, we observe that definitions build on descriptions of incubators' *goals* (e.g. facilitating the growth of startup firms), *behavior/business model* (e.g. the offering of shared office space or business support services), or *both*. However, goals might be different for different types of incubators. While publicly sponsored incubators often are more interested in job creation, private-independent incubators emphasize profitability, and private-corporate incubators tend to focus on contributions to their mother corporation's strategic goals. The most reconcilable approach seems to be defining incubators based on the minimal common ground business model that distinguishes them from other players in the entrepreneurial ecosystem. Therefore, we define a broader (business-incubating organizations) and a narrower (business incubators) definition:

Business incubating-organizations (in the broader sense) are those that support the foundation and/or growth of new businesses as a central element of their organizational goal.

Definition	References
"A facility which promotes the early stage development of a for-profit enterprise [w]ithin the confines of a building (…)"	Plosila and Allen (1985)
"Real estate projects with shared space and administrative arrangements [and] organize the business development process"	Campbell et al. (1985)
"Seeks to effectively link talent, technology, capital and know-how in order to leverage entrepreneurial talent and to accelerate the development of new companies"	Mcadam and Marlow (2007), Smilor and Gill (1986)
"A facility with adaptable space which small businesses can lease on flexible terms and reduced rents [where] Support services are available and shared"	Kuratko and LaFollette (1987)
"Large buildings operated to nurture young companies by providing low-rent space, shared office services and management advice"	Lumpkin and Ireland (1988)
"Centralized physical facilities that 'incubate' new and small ventures by providing them with varying support services and other assistance."	Udell (1990)
"Are multi-tenant buildings providing affordable, flexible space, and a variety of office and support services which share a common purpose: to nurture small fledgling firms into healthy businesses"	Weinberg et al. (1991)
"Locally based institutions that provide shared physical space and business support services to new and young firms"	Markley and McNamara (1995)
"[Organizations that] offer fledgling companies a number of benefits—office space, funding, and basic services such as recruiting, accounting, and legal—usually in exchange for equity stakes"	Hansen et al. (2000)
"Producer' of business assistance programs. (…) companies and the incubator staff are co-located in the same facility"	Rice (2002)
"An enterprise that facilitates the early-stage development of firms by providing office space, shared services and business assistance"	Hackett and Dilts (2004)
"Evolving innovative organizational form that is a vehicle for enterprise development"	Peters et al. (2004)
"Any organization that provides access to affordable office space and shared administrative services"	Bollingthoft and Ulhoi (2005)
"Property-based organizations with identifiable administrative centers focused on the mission of business acceleration through knowledge agglomeration and resource sharing"	Phan et al. (2005)
"Organisations that supply joint location, services, business support and networks to early stage ventures"	Bergek and Norrman (2008)
"Organizations who's purpose it is to support the creation and growth of new businesses, by supplying a shared office environment and agglomeration of new and small businesses"	Honig and Karlsson (2010)
"Tools to accelerate the creation of successful entrepreneurial companies"	Bruneel et al. 2012

Table 3: Definitions of business incubators

> *Business Incubators* (in the narrower sense) are business-incubating organizations that support the establishment and growth of new businesses with tangible (e.g. space, shared equipment and administrative services) and intangible (e.g. knowledge, network access) resources during a flexible period and are funded by a sponsor (e.g. government or corporation) and/or fund themselves taking rent (or less frequently equity) from incubatees.

The first scholarly typology differentiates between publicly sponsored, nonprofit-sponsored, university-related, and privately sponsored incubators (Kuratko & LaFollette, 1987). Kuratko and LaFollette (1987) summarize from previous literature ten different characteristics in which private and public incubators may differ. These include their tenant capacity and selection, governance and exit policy, rent and complementary revenue sources, type of sponsors, services offered, size of staff and the induced growth in jobs and sales. While public incubators receive their agenda from their governmental sponsors and hence usually focus on job creation, private incubators focus on return on investment and their tenants' financial success.

Von Zedtwitz (2003) identified five basic archetypes according to their competitive focus and strategic objective, while Clarysse et al. (2005) differentiated according to goals and strategies. University incubators and regional business incubators serve a scientific or a local community, respectively, and they fulfill primarily a public mission. In contrast, virtual incubators, independent commercial incubators and company-internal incubators are oriented towards making profits or promoting the objectives of their parent company. Similarly, Grimaldi and Grandi (2005) use the institutional mission as one characterizing variable to distinguish between two types of incubator models, i.e. business innovation centers and regional public incubators on the one hand and private incubators on the other hand (university business incubators are situated somewhere between the two models). We summarize these and further typologies that we could identify in Table 4 below.

References	Types									Dimension
van Weele et al. (2016), Bergek and Norman (2008)	strong intervention incubator					laissez-faire incubator				support strategy
Brooks (1986)	property development (single-/multi-tenant) incubator					business assistance (shared space, services) incubator				
Bruneel et al. (2012), Aerts et al. (2007)	real estate (1st generation)			intangible assets (2nd generation)			network (3rd generation)			
Vanderstraeten and Matthyssens (2012)	generalist incubator					specialist incubator				business strategy
Etzkowitz et al. (2005)	mixed incubator		technology incubator		cooperative incubator		traditional incubator			
Peters et al. (2004)	non-profit incubator			university incubator			for-profit incubator			incubatee focus
NBIA, Lewis (2001)	mixed-used incubator	technology incubator	incubatee focus incubator	manufacturing incubator	empowerment incubator	targeted incubator				
Plosila and Allen (1985)	spin-off				start-up					
Sherman (1999)	mixed-use incubator			manufacturing incubator		product development incubator				
Aernoudt (2004)	mixed Incubator	technology incubator	econ. develop. Incubator	social incubator	basic research Incubator					institutional mission
Hackett and Dilts (2004), Allen and McCluskey (1990), Bollingtoft and Ulhoi (2005)	for-profit property development incubator	non-profit development corporation incubator	for-profit collaborative incubator	academic incubator	for-profit seed capital incubator					
von Zedtwitz (2003), von Zedtwitz and Grimaldi (2006)	university incubator	regional business incubator	virtual incubator	independent commercial incubator	company-internal incubator					sponsor/ partner focus
Etzkowitz (2001)	network incubator				university incubator					
Grimaldi and Grandi (2005)	business innovation center	regional public incubator	university business incubator	independent private incubator						
Kuratko and LaFollette (1987), Udell (1990)	publicly sponsored incubator	privately sponsored incubator	university-related incubator	nonprofit-sponsored incubator						
European Commission (2002)	industrial estate	managed workshop	multi-purpose BI	business park	ent. Center	BIC	science park	innovation center	tech. center	multi-dimensional

Table 4: Typologies of business incubators and similar organizations

4.2 Incubation Process

Hackett and Dilts (2004) describe the selection of incubatees, their monitoring and assistance as well as resource infusion as core elements of the incubation and acceleration process. Similarly, for Bergek and Norrman (2008) selection, business support, and mediation are main distinguishing components of incubators, but they mention infrastructure and graduation as further components. While most incubators are similar regarding their infrastructure and graduation policies, they differ widely in their selection strategies, business support services and mediation offering (Bergek & Norrman, 2008). In the following subsections, we review the literature on the incubation process, which we summarized visually in Figure 7.

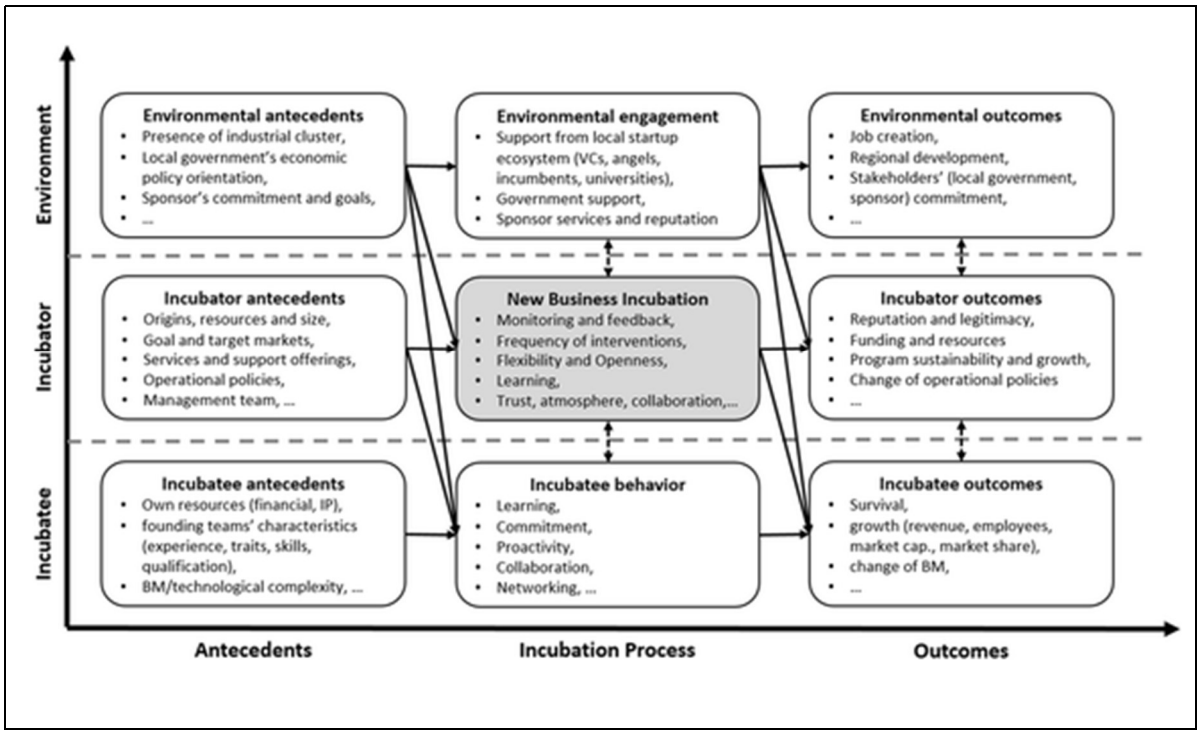

Figure 7: Multi-level antecedents and outcomes of business incubation

4.2.1 Search and Selection

Maintaining a steady flow of quality proposals is a key factor for incubator success (Patton et al., 2009). Therefore, incubators engage in marketing activities to build awareness and

establish a name within the targeted industry so as to attract a sufficient number of applications (Aaboen, 2009). To filter the right candidates, incubators have to choose criteria for selecting their incubatees. In particular, for-profit incubators review candidates rigorously by applying criteria that are similar to those applied by venture capitalists (Ford et al., 2010; von Zedtwitz, 2003). Beyond these criteria, however, corporate incubators consider strategic alignment between their startup portfolio and their parent company as a relevant selection criterion, which is often more relevant than expected immediate financial returns. Lumpkin and Ireland (1988) identify three groups of screening criteria, which include the experience of the management team, financial strength as well as market and personal factors. Using this study as a basis, Aerts et al. (2007) describe the screening practices of European business incubators. They distinguish between financial screeners focusing on financial rations, team screeners emphasizing personal characteristics of the management team, market screeners primarily valuing market factors, and balanced screeners. They find that 61% of incubators are market screeners and 27% are team screeners, while financial and balanced screeners are a rare species.

Bergek and Norrman (2008) provide in their framework a two-by-two matrix to classify selection strategies. Firstly, they differentiate between idea-focused and entrepreneur-focused selection. That means that the primary criterion of selection is either viability of ideas or personal characteristics, experiences and skills of entrepreneurs. Secondly, they differentiate between “picking-the-winners” and “survival-of-the-fittest” selection. The former refers to application of rather strict criteria in order to identify few potentially successful ventures ex ante, while the latter denotes the application of more flexible criteria in order to accept a larger number of firms and then leave it to the market to separate winners from losers. Combining a selection approach from the first dimension with one from the second dimension implies four possible selection strategies.

When selecting new incubatees, incubators also need to consider the dynamics that emerge due to the nature of the overall incubatee portfolio they developed. As tenants in specialized incubators are often active in the same markets, they fear competition and may be more reluctant to share information and network contacts with each other. In addition, if tenants share a similar knowledge base, cross-fertilizations with other technology or business fields are less likely to occur (Schwartz & Hornych, 2008). Tötterman and Sten (2005) in fact recommend that incubators aim for a mix of companies that represent different sections of the value-chain or companies that are in different life-cycle stages.

4.2.2 Business Support

Business support services gained increasing prominence and relevance in the business models of incubators, where the provision of office space and facilities today is mostly secondary. Common areas covered include sales, accounting, law, contracts, patent strategies, presentation technique, advertising, media and negotiation (Aaboen, 2009). The choice of incubatees affects the mix of services provided and vice versa, as the incubator aims to maximize the fit between its services and the specific needs of the new businesses (Hackett & Dilts, 2004). The incubator monitors the performance of their tenant firms and provides feedback to help contain risk by preventing them from making mistakes. When problems arise, the incubator can provide business support services as needed. Incubators can provide this kind of monitored business assistance most effectively through frequent counseling interactions, because this strengthens the relationship between the incubator management and the incubatees (Scillitoe and Chakrabarti 2010). Rice (2002) finds that interaction between incubator managers and entrepreneurs is fundamental for success. The more time incubator managers spend on co-production—in general as well as in each specific co-production episode—and the broader the modalities they use, the higher is their impact. However, for this

co-production to work, entrepreneurs need to be aware of their startup's gaps in knowledge, competencies, and resources, to recognize the potential of the incubator to fill those gaps.

Bergek and Norrman (2008) find that some incubators follow a strong intervention approach, while others choose a laissez-faire regime. Interventionists see their role as managers who guide ventures through the incubation process by the steady hand and sometimes even supply them with complete management teams or require them to do certain trainings. In contrast, laissez-faire incubators perceive themselves as external facilitators of a process that incubatees manage primarily by themselves. These incubators hence supply resource and assistance only on incubatees' request.

McAdam and McAdam (2008) explore the use of incubator resources at different lifecycle stages. They find that the propensity to make use of the resources and support increases throughout the lifecycle and as young firms search for independence and autonomy. At some point, incubatees graduate and move out of the incubator. The incubator management is to specify under which circumstances incubatees have to leave the incubator and help them develop appropriate exit strategies.

4.2.3 Mediation

Whenever incubators lack resources required by an incubatee, like for example specialized, in-depth technical expertise, they can assist incubatees through networking activities (Scillitoe & Chakrabarti, 2010). For instance, Rubin et al. (2015) examine different knowledge agents who surround the incubators and examine knowledge flows taking place in the context of the interrelationships with the incubatees. They distinguish between technological knowledge bearers, market knowledge bearers as well as financial resources bearers.

Incubators manage both an external and an internal inter-organizational field, to which they connect their incubatees (Weinberg et al., 1991). Externally, the incubator should foster business connections between tenants and outside firms, government agencies, and other sources of commercial relevance. Internally, the incubator should facilitate relationships among a pool of resident businesses and administrative staff of the incubator.

While research has initially ignored the role of informal networks, Rothschild and Darr (2005) highlight the role of informal networks of innovation. In their case study of a research university and an affiliated technological incubator they find that a variety of strong and meaningful ties exist, which are to a large degree based on informal contacts between the parties involved. On this basis, a two-way flow of knowledge and goods, from which both organizations benefit, takes place. Patton et al. (2009) find that such possibility to meet and interact with like-minded individuals motivates founders to join the incubator and that the synergies within such an internal support network is a key factor for successful incubation.

Bollingtoft (2012) observes a variety of different networking and cooperation activities among tenants, which appear to support the development of knowledge as well as the companies' growth. Thus, the role of incubators is to facilitate these activities; important conditions include physical proximity and attracting entrepreneurs with a positive attitude towards knowledge sharing and cooperation, as well as a willingness to share values and norms. Therefore, after the exit, the incubator should seek to keep in touch with their alumni so they remain part of the incubator's community (Tötterman & Sten, 2005).

4.3 Performance and Potential Impacts

The evaluation of performance and potential impacts of incubators also has received considerable interest in previous research. Available studies are heterogeneous, using different methodological approaches and focusing on different measures. Some studies

investigate the impact that activities of incubators can have at the individual firm level; others estimate impacts at a macroeconomic level. In addition, some frameworks rely on several dimensions to provide a more holistic picture of incubator performance.

Researchers, who seek to evaluate impact of incubators, face several difficulties. One difficulty concerns the problem to get good and reliable data, because entrepreneurs are often reluctant or too busy to share information, do not keep good records, or engage in self-aggrandizement when providing information (Udell, 1990). Bergek and Norrman (2008) define incubator performance as the extent to which incubator outcomes correspond to incubator goals, but the evaluation of incubators' performance becomes further complicated as goals vary across institutions. It is particularly interesting to assess the impact of incubators on its firms compared to non-incubated firms. However, incubator managers have an incentive to select firms that are likely to succeed and filter out weaker candidates. As a result, the cohort of incubated firms is not representative of the overall population and such selection bias may lead to an overestimation of incubator effectiveness (Udell, 1990; Stokan et al., 2015). Furthermore, we consider selection itself as a central element of the incubation process and as such a factor contributing to the incubator success. Disregarding selection would make it impossible to discriminate between incubators that are bad at selection but good at further support and those that are strong in selection but weaker at further support. Finally, there is significant controversy about which measures are best suited to measure the performance of incubators.

4.3.1 Incubators' Impact at the Level of the New Firm

Adopting the definition of incubators as organizations that help new firms survive and grow, most studies assess incubators' performance in terms of new venture creation and the growth and survival rate of new businesses (Colombo & Delmastro, 2002; Peña, 2004; Schwartz,

2009; Stokan et al., 2015). The majority of these studies is quantitatively oriented and relies on data from questionnaires. In general, the number of graduates is a very rough measure of the ability of the incubator to accelerate the entrepreneurial process (Peters et al., 2004). While graduation tends to be easy, it is more difficult for young firms to prosper in the long term. Schwartz (2009) observes that the discontinuation of support occurring after startup graduation has a negative effect on startup survival, which lasts up to 3 years after leaving the incubator.

One frequently used approach to compare the performance of a group of incubated firms with a comparable cohort of non-incubated firms, is to use matching techniques to control for potential selection bias. Colombo and Delmastro (2002) use this approach to evaluate the effectiveness of Italian technology incubators. They compare a sample of 45 firms in technology incubators located in science parks and business innovation centers to a control sample of off-incubator firms. Their results indicate that input and output measures of innovative activity differ only marginally. However, they find that on-incubator firms have entrepreneurs with better human capital on board, show higher growth rates, and find it easier to get access to public subsidies. They also find these firms to perform better in terms of adoption of advanced technologies, aptitude in participating in international R&D programs, and establishment of collaborative arrangements. Moreover, also Stokan et al. (2015) find positive effects of incubators' activities on firm growth. In particular, they show that incubators have a significantly positive effect on the firm's number of employees and that incubated firms receive five times as many business services as their non-incubated cohort. Schwartz (2013) concentrates on long-term business survival tracking a sample of firms within a publicly initiated incubator over a period of 10 years and comparing their performance to a control group of comparable startups that did not receive support from an incubator. However, results do not indicate that firms located in incubators have higher

chances of long-term business survival than comparable firms located outside incubators do. To the contrary, he finds indications for a negative effect in some cases.

Another group of studies focusses on the impact evaluation of incubator practices and services with regard to the performance of young firms. Aerts et al. (2007) investigate the link between screening practices of incubators and performance. They find that screening based on a balanced set of factors correlates with a higher tenant survival rate. However, while this is useful to know for incubator managers as it indicates that screening works, it tells little about the utility of incubator support since screening practices introduce heavy selection bias if compared to a group not equally screened. The study by Peña (2004) aims to find out the extent to which the support received by entrepreneurs from incubator centers is critical for young firms to survive the difficult initial years. However, the results indicate that the majority of variables related to assistance offered from incubators is non-significant. Peters et al. (2004) focus on the impact of incubator services, including infrastructure, coaching and networks, on the graduation rates of incubatees. They find that merely comparing types of services offered will not be sufficient to explain differences in graduation rates among incubators. Instead, they conclude from their interviews that consideration of selection processes as well as knowledge as a resource acquired through networks and interactions among co-tenants is key to understand incubators' performance in terms of graduation rates. Networks also play a role in the study of Rothaermel and Thursby (2005), in which the authors investigate the effect of university linkages on incubator firm failure and graduation, with linkages being licenses or professors on the firms' senior management team. They find support for their hypotheses that a university link reduces probability of new venture failure, but retards the firm's graduation from the incubator.

Lasrado et al. (2016) investigate whether firms graduating from university incubators attain higher levels of post-incubation performance than firms participating in non-university

affiliated incubators do. Results show that university incubated firms do indeed benefit from their relationship with university incubators. After firms graduate from the university incubator, the number of jobs and sales grew over time, showing that their performance continually improves. Moreover, the authors find that university-incubated firms generate greater employment and sales than non-incubated firms, which indicates superior performance.

In addition to practices and services provided by incubators, further factors may influence their performance. Barbero et al. (2012) point out that performance differs according to the type of incubator. They differentiate between four types of incubators: private incubator, basic research incubator, university incubator and regional development incubator. Investigating 90 incubators in Andalucía, they find that some types perform better in specific performance measures, while others perform worse. They use five categories of performance measures, which include firm growth, participation in R&D programs, input R&D, output R&D and employment generation cost. Regional development incubators do not fulfill their objectives. University incubators perform satisfactorily. Private incubators and basic research incubators performance is outstanding. In a subsequent publication, Barbero et al. (2013) find evidence for significant differences within archetypes concerning the type of innovation generated. Mas-Verdu et al. (2015) employ a fuzzy-set qualitative comparative analysis to analyze the role of incubators in interaction with other factors such as the degree of business innovation, size, sector, and export activity. Their results show that incubators on their own cannot affect business survival likelihood. Instead, combinations with other factors are necessary, e.g. new companies that are large or operate in certain sectors show a higher rate of survival.

4.3.2 Incubators' Impact at the Macroeconomic Level

Besides the impacts at the level of the individual firms, incubators' activities may also have direct and indirect effects on the local, regional or even national economy. Indirect effects often occur because incubated firms create links to other actors and thereby stimulate their economic activities. Researchers use both regional macroeconomic models (Sherman & Chappell, 1998) and input–output models (Markley & McNamara, 1995) to estimate employment and wages directly attributable to incubated firms as well as the indirect effects resulting from their impact on economic activities of other companies. Both articles find that employment and income multiplier effects occur.

Among the most important direct macroeconomic effects of incubators are their significant fiscal impacts, as higher local income results in higher local tax revenue. Thus, results strongly indicate that incubators can be an effective economic development tool. Ratinho and Henriques (2010) in fact investigated whether an entire population of incubators and science parks contributes to economic growth in a converging economy (in this case Portugal). However, they find that the contribution to job creation and economic growth is barely visible and that activities of incubators (and science parks) have, at best, a local impact.

4.3.3 Multi-Dimensional Frameworks for Incubator Performance Evaluation

Some scholars developed multidimensional frameworks as a basis for a more holistic evaluation of incubator performance. These frameworks tend to be rather qualitative in nature and primarily rely on interview data for comparative evaluations of several incubator cases. Mian (1994) provides one of the first frameworks for assessing the practices and performance of incubators. He identifies 13 key characteristics based on a review of incubator studies. These include the origin of facilities, the incubator objective, organizational design, governance, tenant performance reviews, institutional support, staffing, funding resources,

technologies targeted, personal traits of tenant entrepreneurs, strategic operational policies, services and their value added, as well as the survival and growth of tenant firms. He uses this list to evaluate by comparison six university-sponsored incubator programs and finds them all exhibiting positive outcomes, although to very different degrees. He concludes that university-sponsored technology incubators should set reasonable objectives and implement management practices that are conducive to tangible results. In a subsequent publication, Mian (1997) updates the list of characteristics and regroups them into three sets. The first set consists of performance outcomes, the second set includes management policies and their effectiveness and the third set comprises services and their value added. The multiple dimensions of this framework that Mian (1997) suggests in order to evaluate performance are program growth and sustainability, tenant firm's survival and growth, contribution to the sponsoring university's mission, as well as community related impacts.

As a response to a lack of incubatee perspective in this latter study, Chan and Lau (2005) propose a modified framework that captures the effects on technology firms throughout their venture path. They identify nine criteria from the literature and use these to compare performance from the incubatees' perspective. These criteria are pooling resources, sharing resources, consulting/counseling services, public image, networking, clustering, geographic proximity, costing, and funding. They find that the effect of each incubator characteristic on the incubator's tenants depends on the tenants' stage of development.

Most recently, Fonseca and Chiapetta Jabbour (2012) developed a framework with a particular focus on evaluation of the incubators' and the incubated firms' environmental performance. The framework comprises of seven variables, i.e. green building and facilities, green screening process, environmental training, energy management, water resource management, promoting green management, tenants with green proactivity. For each variable, scores are given and the total score allows the classification of incubators according to "levels

of environmental maturity". They apply the framework to six Brazilian incubators and find that in all except one case environmental management is of little importance.

5 Research Gaps and Agenda

The incubator landscape has evolved over the course of time from mere real estate projects or university spin-off facilities to complex, business development-support organizations with a broad range of different business models. In recent years, the business incubation industry has witnessed a significant increase in the number of corporate incubators and accelerators. In fact, the number of accelerators increased from the first accelerator in 2005 (Y Combinator) and a dozen in 2008 to about 180 in 2013 in the US and up to an estimated 3000 world-wide (Hochberg, 2016). There are no precise numbers regarding how many of these have corporate sponsors, but there are several well-known examples, like the AT&T Aspire Accelerator, Axel Springer Plug and Play Accelerator, the Disney Accelerator, or Microsoft Ventures Accelerator. Likewise, more and more incubators with corporate sponsors emerge as well, like the Jaguar Land Rover TechIncubator, the Breed Reply IoT advanced Incubator, or the Bayer CoLaborator.

Due to the recency of these phenomena, there is only a small number of publications. Hence, there are many open questions. Most importantly, corporate incubators and accelerators raise new issues regarding their relationships, not only with their incubatees, but also with their sponsor, which has very different interests than the common public sponsors had. An important aspect of any corporate incubator and accelerator project, whether leveraging internal or external resources, seems to be the establishment of separate organizational units in order to avoid turf battles. Wolcott and Lippitz (2007) call the internal version of this the "producer model". This organizational separation is particularly important where the goal is creating radical innovations that bear the potential to not only cannibalize more or less but

also completely disrupt the business model of one or more of the corporations' business units. This consequence of innovations, this Schumpeterian creative destruction, is often at the root of the innovator's dilemma (Christensen, 1997). A relatively old approach to achieve this is the skunkworks model of innovation (Jenkins, 2001). We therefore consider the skunkworks approach to successfully develop and commercialize radical innovations as an early version at least of company builders, but to some degree also of corporate accelerators. In fact, we think that it is important to show what is actually new about corporate accelerators as a means of corporate venturing and entrepreneurship. However, to date there is still only very limited research on this phenomenon. While corporate incubators offer different kinds of services, there is not much research on what they expect to receive back. In particular, research on differences between corporate and private but independent incubators is highly relevant, but missing. How can corporate incubators align interests between the sponsoring corporation and the incubatees? What are the consequences of the strong asymmetry between a big incumbent corporation and incubatees? Can corporate incubators realize more synergies than private or public incubators? How do they differ in terms of outcomes such as graduation rate, survival rate, or sales growth?

Another important research gap consists in the consideration of quantitative multi-level studies. As we showed above in Figure 7, research can and does investigate antecedents and outcomes of business incubation at least at the three levels of incubatees, incubators, and their environments and communities. However, the interactions between and dynamics across these levels are not trivial and not well understood. This gets even more relevant in light of the discussed emergent phenomena of corporate incubators, because they introduce the corporation as a new and dominant stakeholder in the incubation process.

Finally, we recognize in the theoretical foundations of incubator research an additional research gap. About a decade ago, many studies did not use a consistent theoretical lens

(Hackett & Dilts, 2004). This has changed and Mian et al. (2016) find several theoretical lenses through which to consider incubators, ranging from social network and social capital theory over institutional theory, structural contingency theory to stakeholder view and resource based view. Considering in particular the first research gap regarding corporate incubators, the consideration of open innovation as a theoretical lens for incubation research is promising (Weiblen & Chesbrough, 2015). While open innovation helps to understand the corporate incubator from the perspective of its corporate sponsor, literature on absorptive capacity (Cohen & Levinthal, 1990) could help to explain advantages that incubators have due to their close ties to a corporate sponsor.

6 Limitations and Conclusion

In this systematic review study, we carried out a bibliometric and co-citation analysis. Compared to unsystematic reviews, systematic reviews offer the advantage that they do not introduce an unconscious bias of the researchers carrying out the review. On the other hand, it is also true that our study suffers some usual limitations. Above all, we are limited to the literature that we found in one database, the ISI Web of Science (WoS). Although this is the most comprehensive database available for this kind of study, it is by no means exhaustive. Hence, while we can exclude unconscious bias on our site, we cannot exclude that we missed out some relevant work that is not covered by ISI WoS. In this regard, however, our approach is no different to that of previous reviews, like for example that of entrepreneurship research in general by Schildt et al. (2006).

The same holds for the definition of the research objective and selection of search terms, which is another limitation of this review. However, with whatever care selecting these terms, systematic reviews can never pretend to cover exhaustively such a vast field. What they can

do, however, is to provide an overview of the current state and to point to future directions of the field.

The analysis allowed us to make four distinct contributions to the field of business incubation research. First, we identify the majority of the most relevant extant research, measure each contribution's impact in terms of citations and identify the most central papers in the co-citation network. We could show that the field of business incubation matured into a recognizably distinct field from that focused on science and technology parks, which only investigates one particular form of incubators, namely university business incubators. We could also show that the business incubation literature using social capital theory and social network theory as their theoretical lens grew so much in the last decade that it constitutes an own cluster. Second, we summarized a range of definitions and typologies of business incubators and showed commonalities and differences as well as the progressively changed understanding of the primarily defining characteristics. We derive from our research a reconciling definition of the concept of business incubator in both the broader and the narrower sense. Based on this definition, we show key features of business incubators compared to other related players in the entrepreneurial ecosystem. Third, we provide an overview of key findings from extant literature with a focus on the more central papers and provide a multi-level framework to consider antecedents and outcomes of business incubation as a dynamic process. Fourth, while systematically reviewing the literature, we have discovered recent trends and new topics in both theory and practice. We identify several persisting research gaps in the literature and suggest a range of related questions for a research agenda.

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Paper IV:

Speedboating into the Future: How the Recent Breed of Corporate Venturing Units Promotes Corporate Innovation Strategy

Sabrina Korreck; Piet Hausberg

Abstract:

Incumbent companies, which are facing pressure to innovate ever more rapidly, have long used Corporate Venturing Units (CVU) to hatch internal innovations or support external startups through financial investments. Yet, it seems that a new wave of CVUs with a stronger external and strategic orientation is emerging. Some incumbents established corporate incubators and accelerators to support external startups, while entering in exchange and collaboration with these in order to benefit from their innovativeness. Others founded company builders, which focus on generating, validating and implementing their own internal ideas, while also being very externally oriented through interacting and partnering with actors in the startup ecosystem. These CVU have gained considerable traction in practice, but less so in research. Using a multiple-case study approach, we (1) identify distinct processes taking place in different CVUs; (2) show how they enable strategic knowledge search, selection of strategically fitting ventures and subsequent strategic collaboration; and (3) discuss how these functions help the CVU to fulfil its organizational charter in either a more exploitative or a more explorative mode.

Keywords: Business Incubation, Corporate Incubators, Corporate Accelerators; Company Builder, Corporate Venturing, Innovation Strategy, Qualitative Research

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1 Introduction

Incumbent firms in many industries and sectors face an extremely challenging situation and need to innovate ever more rapidly. Especially the threat of fatal disruption continuously grows (Christensen, 1997), because digitization radically changed the nature of innovation and thus the rules of the game almost everywhere (Nambisan et al., 2017). Hence, it is all the more important to successfully tackle the dual challenge to not only exploit current competitive advantages in the short run, but also make provisions for more radical, path-breaking innovations (March, 1991). However, firms often encounter difficulties in fostering radical innovation, for instance, due to organizational inertia or conflicting organizational norms and structures (Hannan & Freeman, 1984; Henderson, 2006; Henderson & Clark, 1990).

As one possible approach to address this situation, established companies have long used Corporate Venturing Units (CVU) to achieve this goal (Colvin & Miles, 2007), although most research focused on hatching internal innovations (Burgelman, 1983; Mian et al., 2016). External corporate venturing includes traditional forms such as joint venturing, acquisitions, and corporate venture capital (CVC) (Narayanan et al., 2009) and can also be achieved through partnerships with startups (Miles & Covin, 2002), but literature has focused on the investment aspect while neglecting possible strategic benefits. However, in recent years, it seems that a new wave of CVUs is emerging, with an increasing number of established companies having sought to leverage external ventures in a more cooperative way (Becker & Gassmann, 2006). We argue that these CVUs, which include corporate incubators, accelerators, and company builders, have a strong external orientation and can be seen as platforms for exchange that help build bridges between the corporate and startup world.

While, over the past decade, these recent forms of corporate entrepreneurship gained considerable traction in practice, they did much less so in academia. Only few studies focus

explicitly on corporate incubators (Becker & Gassmann, 2006; Branstad, 2010; Ford et al., 2010). While accelerators, in general, received a lot of attention relative to their newness (Cohen, 2013; Cohen & Hochberg, 2014; Dempwolf et al., 2014; Hochberg, 2016; Pauwels et al., 2016), few of them explicitly focus on corporate accelerators (Kohler, 2016; Jackson, & Richter, 2017). The literature on new forms of internal CVUs, like company builders, is equally nascent (Kuckertz, 2017; Scheuplein, 2017). In particular, as to date, no previous research has focused on the processes of these newer types and their role in helping the established company promote innovation.

Thus, in this article we seek to address two research questions: (1) *Processes:* What are the core processes between the principal actors, i.e. the corporate sponsor, the CVU and the ventures? (2) *Connecting processes and innovation strategy:* How do the identified processes contribute to corporate innovation strategy?

In order to answer these questions, we first establish the theoretical background in which our research is located. Subsequently, we lay out the research design and analysis of our qualitative approach. Presenting the results, first, we outline the processes of CVUs that take place in the context of interactions between the CVU, the established company and the startup world. Then we describe how these processes serve particular functions and relate to corporate innovation strategy. In the next section, we discuss several ways of how the corporate parent benefits from the innovativeness of startups and highlight differences regarding explorative and exploitative orientations of the CVUs. Finally, in the concluding section, we summarize our findings and highlight their theoretical as well as managerial implications before discussing the limitations of our study and providing suggestions for future research.

2 Theoretical Background

2.1 Business Incubation and Its Processes

While over time a plethora of definitions emerged that attempted to clarify what incubators are and are not (Sharma & Chrisman, 1999), none of these definitions gained universal acceptance (Albort-Morant & Ribeiro-Soriano, 2016). Most incubators initially were publicly funded policy instruments that aimed at local economic development and provided affordable office space and shared office services (Mian et al., 2016). Later, the range of value-added services expanded and included mentoring, networking and commercialization enablers (Etzkowitz, 2002; Hackett & Dilts, 2004) and also private independent incubators emerged, mostly focusing on high-tech start-ups (Aerts et al., 2007; Hackett & Dilts, 2004). Their services put stronger emphasis on the provision of direct access to capital and specialized services (Grimaldi & Grandi, 2005). In a most recent review on the literature regarding business incubators, Hausberg and Korreck (2018) distinguish at least 17 different typologies. In an attempt to consolidate the variety of existing definitions, they suggest that business incubators are organizations that support new business growth

> *"with tangible (...) and intangible (...) resources during a flexible period and are funded by a sponsor (e.g. government or corporation) and/or fund themselves taking rent (or less frequently equity) from incubatees."* (2018, p. 13)

Meanwhile, the evolution of types of business incubating organizations and their characteristic approaches continues. In recent years, the phenomenon of accelerators attracted research interest (Pauwels et al., 2016). Accelerators are, like incubators, business incubating organizations. However, they deviate with some noteworthy characteristics from the above definition of incubators. While incubators usually offer shared office space (and other facilities) for a small rent and without a priori fixed time horizon, accelerators typically take startups in fixed-term programs in exchange for equity (Cohen, 2013; Cohen & Hochberg,

2014). In addition, accelerators put more emphasis on connecting their startups to experienced entrepreneurs, venture capitalists, angel investors and corporate executives and preparing their startups teams for public pitch events (Cohen, 2013; Cohen & Hochberg, 2014; Hochberg, 2016).

Core components of incubation include selection, provision of infrastructure, business support and mediation, as well as graduation (Hackett & Dilts 2004; Bergek & Norman 2008). In order to attract applications, incubator staff must engage in marketing activities to build awareness and establish a name within the targeted industry (Aaboen, 2009). Selection criteria are then applied to filter suitable startups from a pool of candidates; these typically focus on personal experience and characteristics of the team, financial ratios as well as market factors (Lumpkin & Ireland 1988; Aerts et al. 2007). For-profit incubators seem to review candidates rigorously by applying criteria that are similar to those applied by venture capitalists (Ford et al., 2010; von Zedtwitz, 2003). Beyond these criteria, however, corporate incubators consider strategic alignment between their startup portfolio and their parent company as a relevant selection criterion, which is often more relevant than expected immediate financial returns (Kohler, 2016).

Incubation involves monitoring of performance (to prevent startups from making mistakes) and to match them with the right support as needed (Hackett & Dilts, 2004, Patton et al., 2009). Business assistance is (most effectively) provided through frequent counseling interactions; whereas such interaction between incubator managers and incubatees is (found as) fundamental for success (Rice 2002, Scillitoe & Chakrabarti, 2010). Not only relationship to incubator staff is important but also relationships among the startups: incubators should facilitate networking and cooperation among startups, which support the development of knowhow as well as the companies' growth (Bøllingtoft, 2012).

When the incubator lacks the specialized knowledge or resources required, it can assist the startups through networking activities (Scillitoe & Chakrabarti, 2010). Externally, the incubator connects their incubatees to outside firms, government agencies, and other sources of commercial relevance (Weinberg et al., 1991). Finally, the incubator helps the startups to develop appropriate exit strategies for leaving the incubator (Patton et al., 2009).

2.2 Approaches to Corporate Venturing: Incubators, Accelerators, Company Builders

Corporate venturing (CV), the creation of new business organizations by existing organizations (Sharma & Chrisman, 1999), can be a promising strategy to prepare for radical innovation, while simultaneously exploiting current competitive advantages. Research explored approaches like ambidexterity through structural separation (O'Reilly & Tushman, 2008), the skunkworks model (Fosfuri & Rønde, 2009), and corporate venturing units (Hill & Birkinshaw, 2014) as possibilities to increase exploration without hurting exploitation and thus overcome this dilemma by separating new ventures from the existing corporate structure.

Research distinguishes not only between CV that leads to new organizational entities within (internal CV) or outside (external CV) of the firm (Sharma & Chrisman, 1999). Also the origin of the entrepreneurial activities has been seen both inside (Burgelman, 1983) and outside of the firm (Sykes, 1986), which sometimes is equally defined as internal and external CV. However, while there are several studies on corporate venturing units (CVUs) (Basu et al., 2016; Hill & Birkinshaw, 2014) and while it is acknowledged that external CV can also take the form of strategic partnerships between established and emerging firms (Miles & Covin, 2002), literature covers principally corporate venture capital (CVC) units when investigating CVUs.

This investment-focused view of CV does neglect the potential value of non-equity-based cooperation between established corporations and startups as well as in the entrepreneurial

spirit and startup-like agility of small, highly autonomous venturing teams. A considerable amount of knowledge and creativity is located outside of the firm (Chesbrough, 2003) and is not easily tapped through acquisition, as recent CVC research already addresses (Basu et al., 2016). In fact, recently, we can witness corporations increasingly trying to leverage external ventures in a more cooperative way (Becker & Gassmann, 2006). These efforts build on the adoption of venture supporting institutions previously only known as either independent firms specialized in offering venture support services or publicly funded organizations used as tools of economic policy, namely incubators and accelerators (Kohler, 2016; Weiblen & Chesbrough, 2015). These corporate incubators and accelerators hence constitute a new form of external CVUs.

Another recent and growing phenomenon, although still little noticed in scholarly literature, is that of company builders. Company builders are described as similar to incubators, but with the important difference that they internally develop ideas for new ventures and only source part of the staff to develop it (Kuckertz, 2017; Scheuplein, 2017). The goal of company builders is to exit from their new ventures through IPOs once they are sufficiently mature. Like in the case of incubators and accelerators, we can also observe a growing number of corporate company builders.

Previous literature suggests that both sides, startups and established firms, can benefit from their cooperation and that established firms valued less the financial and more the strategic benefits of external CV (Miles & Covin, 2002). However, while the new forms of external CVUs (corporate incubators and accelerators) as well as the updated version of internal CVUs (corporate company builders) might be heavily inspired by the private-independent organizational forms that they try to imitate, it is not clear how far this analogy takes. Private incubators and accelerators have to work profitably and public ones often have to contribute to goals like regional development or job creation. We argue that the stronger focus on

strategic benefits rather than financial ones leads to some distinctly different processes and arrangements in the corporate counterparts.

The stronger strategic interest of the corporate investor as opposed to the mere financial interest of a pure VC fund can negatively affect the relationship formation, because startups might fear imitation in weak IP regimes (Dushnitsky & Shaver, 2009). Consequently, CVCs apply practices that clearly distinguish them from non-corporate VC funds (Souitaris & Zerbinati, 2014). Likewise, different processes might be required, for example in order to develop and maintain inter-organizational trust between corporate sponsor and incubatees so as to prevent conflict (Jackson & Richter, 2017). Corporate incubators and accelerators, in fact, have been found to often refrain from taking equity in startups (Kohler, 2016). However, there is even less research explicitly on corporate incubators and accelerators and none on the inner workings of these organizational arrangements and how they relate to innovation strategic orientation.

3 Methodology

3.1 Research Design and Sampling

Given that our aim is to identify processes between principal actors and examine how these relate to corporate innovation strategy, we focus on the 'how' and 'why' of corporate venturing units. Therefore, we applied a qualitative and explorative research design to gather answers and provide theory inductively in a way most appropriate to such type of questions (Eisenhardt & Graebner, 2007). Choosing a grounded theory approach (Corbin & Strauss, 1990; Glaser & Strauss, 1967) seemed appropriate to analyze CVU processes and find out how they relate to corporate innovation strategy. Rather than focusing on a single "one-shot case study" (Campbell, 1975), we employed a multi-case study design (Yin, 1993), focusing on corporate venturing units as the unit of observation. The cases are the different corporate

venturing units, with each unit being one case as indicated in the pertinent literature (Miles & Huberman, 1994).

Our sampling strategy focused on the most recent generation of CVUs, which have been established within six years prior to the interview. We identified and collected data on corporate venturing units (e.g. via websites such as www.corporate-accelerators.net/database/), whereas the sine-qua-non requirement for a CVU to qualify as "corporate", and thus to be included in our sample, was that at least one corporation finances or sponsors its operations and has a considerable stake in its activities. In order to capture a wider set of processes, our selection of cases aimed at increasing the variance (Miles & Huberman, 1994). Thus, we included CVUs that are active in different industry sectors and were founded by both multinational corporations and medium-sized companies. Our aim was to conduct the interviews on the premises of the corporate venturing unit, where possible, in order to get a first-hand impression of the work atmosphere and organization style. This approach combined with budgetary constraints meant that we had to conduct most of our interviews in Germany.

3.2 Data Collection

For our data collection, we conducted interviews with decision-makers in 13 different corporate venturing units over a period from June 2016 to February 2018. We contacted potential interviewees via email and provided them with basic information about the purpose of our research. In most cases, we visited the premises and conducted the interview in a direct face-to-face setting. This allowed us to be more immersed and gain a better understanding of what it means to work in the specific context. Moreover, meeting interviewees on site helped establish a trustful atmosphere, and observing body language and nonverbal communication enabled us to better interpret some of the interviewees' comments. In cases where on-site visits were not convenient, we conducted the interviews via phone or Skype. The interviews

were held partly in German, partly in English, depending on the interviewee's preferences and background.

The interviews were semi-structured, i.e. based on our research questions we developed an interview guideline with introductory questions for each topic section. Thus, the interviews were rather guided conversations allowing interviewees to answer openly and potentially helping us discover novel aspects that we had not considered before. As commonly advised for inductive, qualitative studies, we reviewed and - where necessary - adjusted our interview guideline questions. Finally, we terminated our data collection when we noticed that no new insights emerged and we had reached a point of theoretical saturation (Glaser & Strauss, 1967).

The interview guidelines consisted of different sections. After explaining the research purpose, we first started exploring the interviewees' background, the relationship between the corporation and the corporate venturing unit and how and why it was initiated. Second, we asked the interviewees for a description of their operational processes. Third, we moved towards questions on how the corporate venturing unit mediates engagement between startups and the corporation. Our last section specifically dealt with the role of CVUs as a means for an incumbent's external knowledge search.

In most of the interviews, both researchers participated in the interview. Subject to the interviewees' prior consent, we recorded the interviews, transcribed and anonymized them. This led to 346 pages of transcripts. The interviews lasted between 38 minutes to 105 minutes and, on average, approximately 75 minutes. For the purpose of triangulation, our research also included an analysis of additional documents, such as field notes on observations and informal discussions, presentation slides provided by the interviewees, press releases or information from their websites, as well as relevant articles in public media.

The data analysis and coding followed steps described in the literature (Eisenhardt & Graebner, 2007; Corbin & Strauss, 1990). In practice, we followed a rigorous qualitative coding approach (Gioia et al., 2012), which was successfully used also in previous studies on similar topics (Basu et al., 2016). To support the process of data analysis, we used the software MAXQDA, which helped us organize our codes and refine emerging constructs. In a first step, we applied 1327 in-vivo and open codes to label relevant quotes, which described interactions and processes between the major actors involved, i.e. the CVU itself, the corporate parent, as well as the ventures, which are part of a broader entrepreneurial ecosystem. In a second step, these codes were related to each other, which helped identify our 24 first-level categories. Finally, these first-level categories were aggregated into 7 second order concepts.

3.3 Description of the Sample

While the CVUs in our sample have been established in recent years, many of the corporate parents were relatively old companies, which have been firmly established in their respective core markets over a long period. We present details of cases in our sample in Table 1.

The CVUs are designed to build bridges between the corporate and startup world and we find that the external orientation towards the startup ecosystem is reflected in the way CVUs are managed and set up.

First, many interviewees stressed the need to run a CVU like a startup itself, because speed and flexibility are critical. Thus, in order to be detached from corporate culture and avoid corporate bureaucracy including its slow processes and rigid rules, the majority of CVUs was legally separated from the corporate parent. In five cases, CVUs were set up as independent subsidy, which is owned 100% by the corporation to retain ownership of the results. In fewer

cases the corporate parent initiated the CVU as an integrated organizational entity or as a project within the existing organizational boundaries.

Table 1: Overview of cases

Case	Sector	Firm Type	Firm Age	CVU Age	Legal relation		CVU Location(s)	Spatial relation
1 Alpha (A)	Electronics	SME	> 40 yrs	1-3 yrs	Integrated	Own	Germany	Same building
2 Beta (B)	Pharma	MNC	> 120 yrs	1-3 yrs	Integrated	Own	DE (+ 1 foreign)	Separate building
3 Gamma (Γ)	Banking	MNC	> 80 yrs	4-6 yrs	Subsidiary	Own	Germany	Off-site
4 Delta (Δ)	Waste Management	MNC	> 120 yrs	1-3 yrs	Integrated	Own	Germany	Off-site
5 Epsilon (E)	Banking	MNC	> 10 yrs	1-3 yrs	Integrated	Own	Germany	Off-site
6 Zeta (Z)	Media	Several firms	Varies	1-3 yrs	Subsidiary	JV*	Germany	Off-site
7 Eta (H)	Aerospace	Several firms	Varies	4-6 yrs	Independent	AaaS*	USA (+ 3 foreign)	Off-site
8 Theta (Θ)	Commerce	MNC	> 40 yrs	1-3 yrs	Integrated	AaaS*	Germany	Off-site
9 Kappa (K)	Digital	Several firms	Varies	4-6 yrs	Independent	AaaS*	Israel	Off-site
10 Lambda (Λ)	Aerospace	MNC	> 40 yrs	1-3 yrs	Integrated	Own	Germany (+3 foreign)	Separate building
11 Mu (M)	Aviation	MNC	> 40 yrs	1-3 yrs	Subsidiary	Own	Germany	Off-site
12 Nu (N)	Commerce	MNC	> 40 yrs	4-6 yrs	Subsidiary	Own	Germany	Off-site
13 Xi (Ξ)	HVAC*	SME	> 80 yrs	1-3 yrs	Subsidiary	Own	Germany	Off-site

* HVAC = Heating, Ventilation & Air-Condition; JV = Joint Venture, AaaS = Accelerator-as-a-Service

Second, corporate parents typically act as initiators and supervisors and entrust entrepreneurially experienced teams with managing the actual CVU operations. In the case of the accelerators, we often observed that the established company operates the CVU in partnership with others. One possibility is to buy acceleration services from private independent accelerators, who manage the programs or provide certain services such as mentoring. In one other case, the established corporation sponsored and benefitted from the activities of an accelerator, which was initially set up and managed by a venture capital firm. We like to think of these as acceleration-as-a-service providers. In addition, in one case in our sample, several companies that are active in the same sector initiated a joint accelerator. This

offers the advantage of sharing costs and risks, while allowing the CVU to be even further detached from any single corporate logic.

Third, most CVUs in our sample were located geographically distant from the corporate headquarters, or at least in a physically detached building. In line with literature on skunkworks and the influence of architecture on creativity and collaboration in organizations (Bommer et al., 2002), we find that even short distances of separation suffice to provide the required degrees of freedom, allowing the CVU to have a different culture and think and act differently. Moreover, location choice seems to be driven by the need for proximity to the startup ecosystem, which is why CVUs deliberately choose a location close to the entrepreneurial hotspots.

Finally, CVUs use different business models. Corporate incubators and accelerators seek to exchange and collaborate with external startups, while supporting them with company-specific resources. Corporate incubators put stronger focus on providing affordable workspace and let startups work relatively autonomously, while exploring possibilities for cooperation. Corporate accelerators support startups very actively during a fixed period, especially through extensive mentoring and business support. Company builders aim to generate, validate and implement their own ideas. Their ventures can equally benefit from utilizing resources of the corporate parent. Given that they interact and partner with startups and other actors in the ecosystem, they are also very externally oriented. However, they rarely engage with external startups to work directly with them, nor do they develop the ideas of external entrepreneurs. Two cases in our sample implemented hybrid business models; for instance, one CVU selected external startups for their acceleration program, in which also intrapreneurial teams participated.

4 Results

4.1 Core Processes

In a first analytical step, we identified interactions between the principal actors and focused on the processes taking place within them. As we show in Figure 1, we identify three central actors in all CVUs we analyzed: the CVUs themselves, the startups and ventures (which are themselves part of the larger ecosystem), as well as their corporate parents. Compared to private incubators and accelerators, the corporate parents constitute an additional player in this picture. Structurally, they occupy a position similar to that of the governmental bodies sponsoring public incubators and accelerators. We decided to disregard further peripheral actors in order to focus on the processes and on how these help promote the CVU's organizational charter.

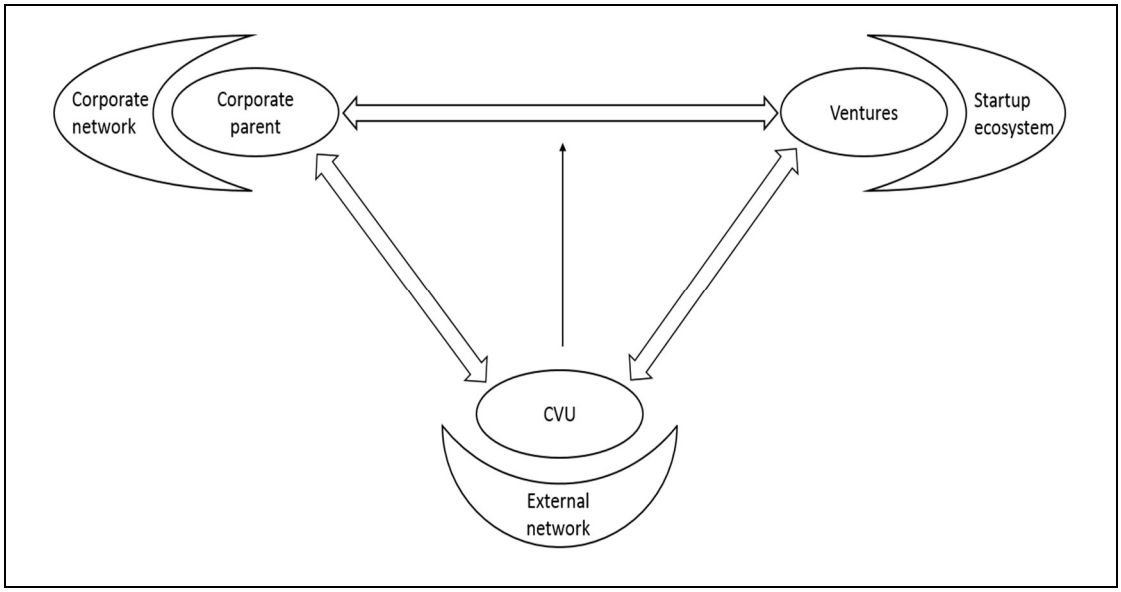

Figure 1: Actors in the Corporate Incubation Process

4.1.1 Interfacing

At first, we identified a process that concerned the way external and internal boundaries between the CVU and the established company are managed. Once the decision has been

taken to initialize a CVU, interfaces have to be set up and maintained to establish connectivity and enable smooth interaction. Thus, interfacing refers to all activities that allow the CVU to communicate fluently with the corporate parent and efficiently receive and transmit information and knowledge both ways. One interviewee described the difficulty and sensibility of this process metaphorically:

"So it's like in space, you have a spaceship [trying to dock at the space station] and it should make ‚click'." (Zeta)

In our interviews, the interfacing process emerged from the following three first-order categories as shown in Figure 2.

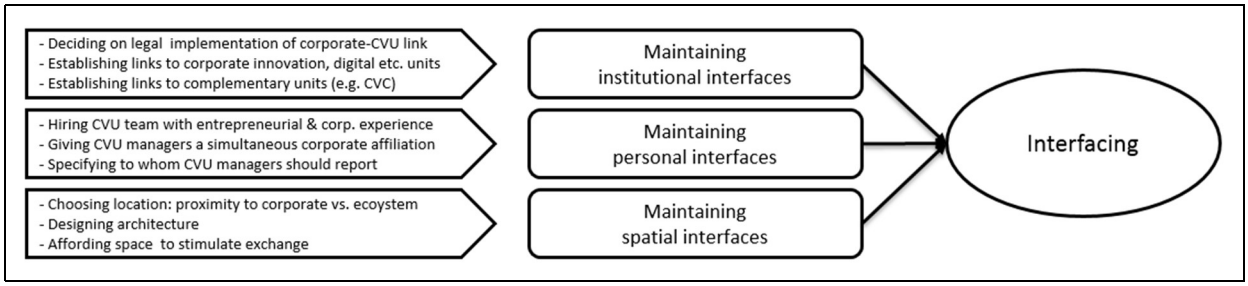

Figure 2: Coding structure for "Interfacing"

Maintaining personal interfaces. A first step when setting up a CVU involves establishing personal interfaces by recruiting qualified staff. A main task of the CVU team is to communicate with both corporate and startup world. According to our interviewees, this is not trivial, since they speak different languages making it difficult to understand each other. Typically, there exists a cultural gap that manifests itself in different ways of problem solving, different mindsets, or colliding thought worlds (Dougherty, 1992). One interviewee told us:

*"The [corporation] looked for someone, who was able to build a bridge between these two worlds, between the startups, on the one hand, and the established corporation, on the other, who both have their culture, history, peculiarities."(*Theta)

Therefore, an essential qualification for moderating between the two worlds is to have work experience and, thus, an understanding of both sides. On the one hand, CVU managers have similar professional profiles, as they have typically worked for many years in the corporate parent or at least in the relevant sector. Hence, they have already established relations with in-house contacts and contacts within the corporate network and know whom to contact when startups need corporate support. On the other hand, CVU managers often have an entrepreneurial background themselves, as they successfully founded their own business, engaged as intrapreneurs, or managed another incubator before. Moreover, having experience in strategy consulting, coaching or communication appear to be further useful qualifications. In addition, we found that CVU managers often have a simultaneous affiliation with the corporation. For instance, they are often members of the corporation's innovation management team or work as a technology scout or chief digital officer (CDO). Such a double function is somewhat similar in its effects to that of gatekeepers and boundary spanners (Leifer & Delbecq, 1978; Tushman & Katz, 1980). Finally, it has to be specified to whom the CVU team has to report in the established corporation.

Maintaining institutional interfaces. Another step when setting up a CVU involves deciding on the legal relationship between CVU and incumbent company. However, regardless of the legal link, CVUs interface with the corporation through links to internal units such as strategy, innovation or business development departments and exchange and work closely with its staff. In some other cases, CVUs were connected to corporate units that are responsible for digital transformation or alliance management. Moreover, we found CVUs frequently interacting with units that complement their activities, e.g. corporate investment vehicles or related incubators and accelerators in other locations or with different thematic focuses. Finally, we observed that CVUs often exchange with other innovation initiatives or even informal "innovation hubs" or groups that share a similar mission.

Maintaining spatial interfaces. The CVU premises itself provide a meeting place. Corporate managers and employees are frequently invited, or even encouraged through an open door policy, to visit the CVU and meet the ventures. We found that the CVU location is carefully chosen and that the architecture and interior of the work environment is intentionally designed to foster an open and collaborative atmosphere, where people can meet and intermingle. For instance, in cases where the CVU was located at the corporate headquarters, social rooms or recreation areas (e.g. a volleyball field or ping-pong tables) were provided to enable startup as well as corporate employees to come together.

4.1.2 Corporate Controlling

Despite granting the CVU a high degree of autonomy, the corporate parent seeks to direct and influence the CVU's operations. In many ways, the established company determines the CVUs' agenda continuously, controls which startups and ideas to select and whether there will continued collaboration or investment at the end of the program or whether ventures will be integrated as business units. In our interviews, the corporate controlling process emerged from the following four first-order categories as shown Figure 3.

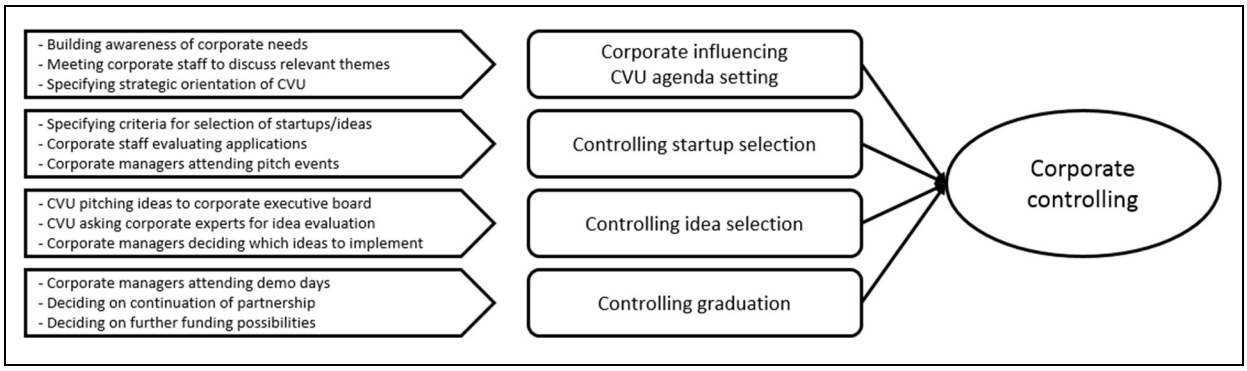

Figure 3: Coding structure for "corporate controlling"

Agenda setting. In order for the CVU to work properly, it must be aware of the themes and technologies that are relevant to the incumbent company. Thus, in order to gain a common

understanding of the corporation's needs continuous consultation is necessary. For instance, one interviewee told us that they regularly meet with responsible business line managers to discuss themes and jointly specify the focus of startup and idea selection. In another case, an incubator manager and a corporate manager jointly went on a field trip to the Silicon Valley to get input that would help them determine the requirements and direction of their own soon-to-be-established CVU.

Controlling startup selection. We found that established corporations exert strong influence on the selection of startups to accept for intake into the incubator or accelerator. For instance, they may exert influence by involving experts from corporate units, or even customers, to provide assessment during the pre-selection process. CVUs ask corporate employees, for instance, to check whether the startups' business model complies with regulatory obligations or to provide technical assessment. In accelerators, CVUs typically organize pitch events in which corporate representatives participate and evaluate startups. Finally, corporate managers are usually involved in the final decision-making regarding the selection of startups.

Controlling idea selection. Instead of startup selection, in the context of company builders, the established company exerts influence on the determination of ideas the CVU should pursue further. We found that, typically, an intense exchange takes place between the CVU and corporate management. In such meetings, the CVU pitches its internal ideas that are then jointly discussed and evaluated. One interviewee described the purpose of this consultation as follows:

"We need a corporate reality check. Otherwise, we are seen as externals and come with ideas that are difficult to implement and adapt. And this filter is now the question to the management: Do you want to make this idea? Do you want to develop it further? Do you give us the time to report to you how the topic continues? (...) Thereby, we think we can ensure that ideas within the group have the necessary weight and management attention to develop further and not to silt." (Mu)

Moreover, and similarly to incubators and accelerators, company builders consult company-internal experts for an assessment of specific ideas. Finally, corporate managers may retain a veto-right for themselves and co-decide which ideas the CVUs can implement.

Controlling graduation. At the end of the incubation or acceleration period, startups graduate and move out. If startups have performed well, this may lead to continued collaboration or investment. One interviewee expressed this as follows:

> *"When the startups find a good use and fertile ground in [corporation], then there is the possibility to continue. (...) But there is no guaranty for that. That's to say: there's a chance for that." (Theta)*

In the context of company builders, ventures may be spun off, transferred to corporate business units, or closed down. In all these cases, we found that the established company has a significant say on the further development path of the startups and ventures. For instance, acceleration programs typically end with a "demo day" where startups pitch their accomplishments. Corporate stakeholders are present and will be involved in decision-making afterwards.

4.1.3 Environmental Scanning

CVUs are not only present in, but also active actors of the startup ecosystem. Through the process of continuously scanning the environment, CVUs stay up to date, and see, for instance, which startups have been newly founded, where venture capital is being invested, which new technologies emerge, and which trends are beginning to appear. The resulting knowledge is discussed and interpreted to produce a holistic understanding of ongoing developments in the startup ecosystem, which provides a crucial basis for the CVU's work. As shown in Figure 4, we identified three first-order categories in our interviews, which underlie this environmental scanning process.

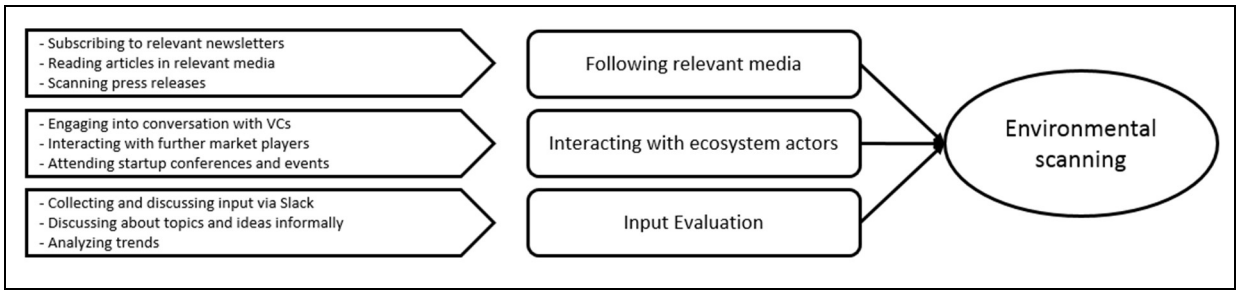

Figure 4: Coding structure for "Environmental scanning"

Following relevant media. In order to stay informed about ongoing developments in the startup ecosystem, CVUs use different information sources. Much information is accessible in published format, for instance, in online and print magazines, social media feeds, press releases, or relevant newsletters. Reading these, the CVU teams absorb a lot of insights and information. The commonality in environmental scanning across all CVU types contrasts with differences in the other two aspects.

Interacting with ecosystem actors. As noted in research on knowledge transfer (van Wijk et al., 2008), given the increasing availability of information and knowledge due to digitization, access to implicit, tacit, and sensitive knowledge has gained importance (Grant & Baden-Fuller, 2004), requires trust and commitment to inter-personal and inter-organizational relationships and thus remains difficult. Consequently, CVUs engage frequently, and often informally, in conversation with actors in the ecosystem to absorb knowledge that often is implicit or tacit and precludes more explicit and formal ways to access it. One interviewee described this as follows:

> *"You try to be present in the ecosystem, talk to people, also informally, about things you won't find online. So you hear what people are planning to implement and sometimes you discover exciting things that will be implemented."* (Gamma)

Such interaction may happen, for instance, at industry events or meetups but has to occur continuously. Continuity maintains strong and trustworthy relationships that characterize the embeddedness and lead to preferential access to very cutting-edge information. However,

there are some notable differences as to how the individual types of CVUs approach this issue. We observed that corporate incubators and accelerators focus on the interactions with startups and entrepreneurs. In contrast, company builders put more emphasis on talking to investors or other central actors in the ecosystem, who help them evaluate the market as well as business cases and the market potential of their ideas.

Input evaluation. CVU employees pick up different pieces of information and share them within the team. Relevant information is then discussed internally. This happens during informal debates, in specific workshops, or in an IT-based way, for instance, through team collaboration tools such as "Slack". Even more than incubators and accelerators, company builders engage in in-depth research and analysis (with a view to trends as well) to understand corporate "pain points" and customer needs. For instance, one interviewee told us how they engage in face-to-face customer interviews to further validate the information they already had:

> *"For a few projects, we have conducted interviews. Although we say it is not nearly representative, but if from 50 or 60 interviewed persons no one mentions the topic in its basic concept, then it's an indication (...) that it does not really seem to be a topic. Thus, we take what is available in market research and customer surveys and try to turn it into something tangible."* (Mu)

4.1.4 Pre-Selection

Another identified CVU process refers to the pre-selection of ideas and startups. Here, we notice the most evident differences between company builders, on the one hand, and corporate incubators and accelerators, on the other. The latter rely on intensive marketing efforts to attract external startups, then filtering the most interesting ones. In contrast, while company builders engage in some marketing activities, too, they generate internal ideas and filter out the most promising ones. While doing so, they remain in close contact with partners within

the startup ecosystem and take up their feedback. In our interviews, the pre-selection process emerged from the following three first-order categories as shown in Figure 5.

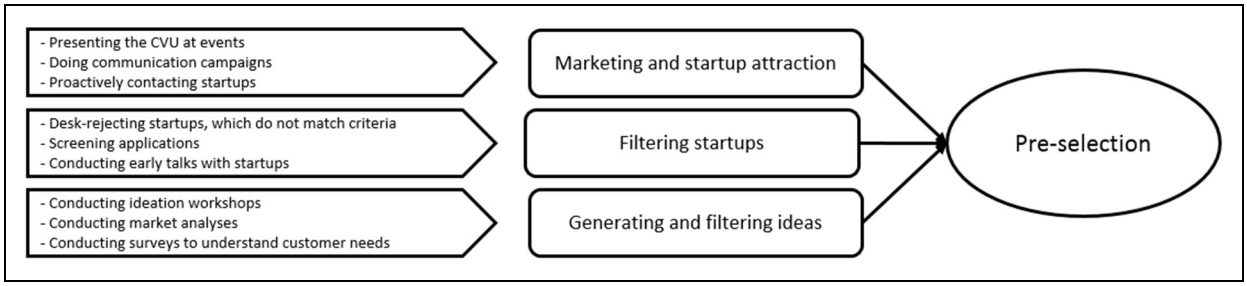

Figure 5: Coding structure for "Pre-selection"

Marketing and startup attraction. All CVUs undertake marketing efforts. However, in corporate incubators and accelerators, these activities seem more intensive and important as they seek to attract a high number of quality applications, which is a key success factor (Patton et al., 2009). Thus, in order to promote their offering, they prepare communication campaigns, which, for instance, include sending newsletters, placing articles in relevant classic and social media, holding presentations at co-working spaces or various kinds of events (conferences, lectures, meetups, etc.), or asking mentors and alumni to promote the CVU within their personal networks. Moreover, they usually also proactively scout and contact additional startups that appear to fit the specified search profile.

Filtering startups. Some corporate incubators and accelerators expect all interested startups to enter into their formal application procedure, while others conduct rather informal talks, for instance, when they meet interested startups at events. Either way, the CVU staff carries out a first filtering to sort out applicants, who do not match the selection criteria. Then, CVU teams often invite startups to initial talks or phone calls to get a better understanding of the product and problem, see whether the team is manageable and evaluate possible collaboration opportunities with the corporation.

Generating and filtering ideas. Corporate incubators and accelerators do not carry out ideation activities, since they source the ideas coming with external startups. Company builders, in contrast, have targeted and intense ideation sessions, which often involve in-depth market research, for instance, through trend scouting, surveys, or conducting face-to-face user or expert interviews in order to discover unresolved problems that customers face today or will face in the future. These ideas will then be thoroughly evaluated and prioritized, often by means of a structured stage-gate process. This process goes hand in hand with the environmental scanning process described above, i.e. CVU teams engaging in continuous interaction with different actors in the ecosystem such as venture capitalists, experts and startups in order to receive feedback that may help them validate whether their ideas could work.

4.1.5 Supporting Venture Growth

A third and central process taking place in the context of the interaction between CVUs and startups is the actual growth support that extends over the entire duration of a venture's stay in the CVU. In line with literature (Scillitoe & Chakrabati, 2010; Rice, 2002), which found that monitored business assistance is most effectively provided through frequent counseling interactions, CVU staff observes and interacts closely with the teams to discover possible difficulties early on. In case the ventures need support, the CVU team can provide first-level support or connect them to actors in their external network. Regarding company builders, the internally generated ideas are implemented by the company builders themselves. As shown in Figure 6, we identified five first-order categories in our interviews, which underlie this process of supporting venture growth.

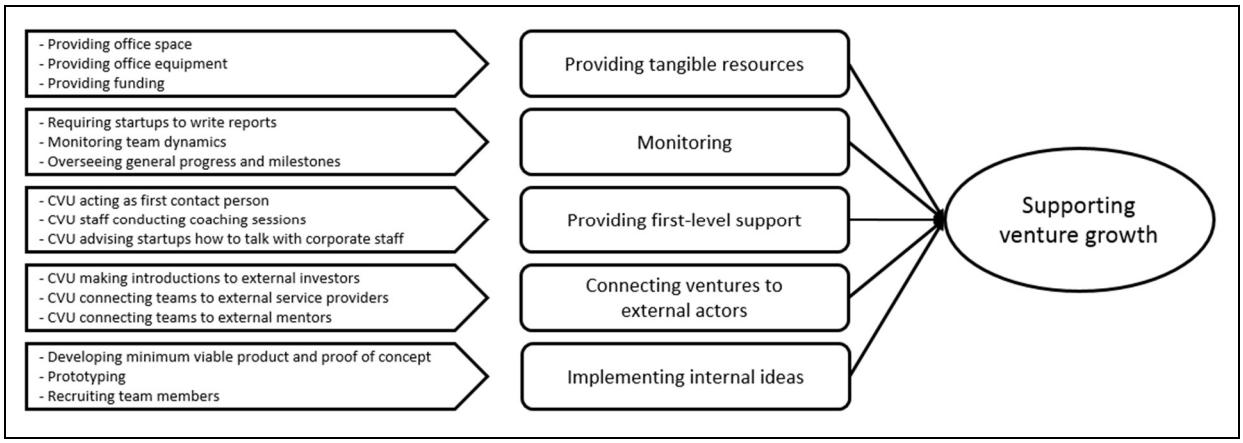

Figure 6: Coding structure for "Supporting venture growth"

Providing tangible resources. At first, CVUs provide ventures with a broad range of infrastructure as well as tangible resources. Corporate incubators, which fund themselves by taking rent, put most emphasis on this aspect as a means to promote their incubatees' growth. This includes providing them with, or at least helping them to find, office space. Moreover, some CVUs equip ventures with, for instance, hardware, software or access to laboratory facilities or allow them to work with corporate data. Some accelerators provide seed capital to startups, partly in exchange for equity.

Monitoring. One key task of CVUs is to monitor their ventures' performance. The CVU team is on site and observes, requests them to provide reports, and talks with them regularly. One interviewee described their monitoring routines as follows:

"Once a week, for at least one hour, they [the startups] sit together with a coach and discuss what they wanted to do, what has been achieved, where they have problems and they just discuss the status." (Lambda)

Thus, the CVU team keeps aware of, for instance, whether startups meet the deadlines to which they committed, how their team dynamics evolve, or if they lack expertise in certain areas. The identification of such problem areas serves as a basis for providing the startups with adequate support and thus help them overcome challenges.

Provision of first-level support. While the team of company builders has a more active role in the actual development of their ventures (e.g. by first acting as managing director and later appointing a new managing director), corporate incubators leave their incubatees much autonomy and support them only sporadically or on demand. The accelerators' approach lies between these extremes. Their support is intense, but their startups develop autonomously. However, in all cases the CVU team serves as the first contact, when startup and venture teams have questions. Due to their own corporate and entrepreneurial experience, the CVU employees themselves are often qualified to give the venture teams advice.

Connecting ventures to external actors. If deeper, more specialist expertise is requested on, for instance, technical or legal matters, CVU teams can assist ventures by connecting them with qualified experts either inside the established corporation (see the first-level category 'active relationship building' below) or with knowledgeable people or service providers in their external network. Moreover, we found that CVU teams often introduce ventures to external third-party investors.

Implementing internal ideas. In contrast to corporate incubators and accelerators, company builders implement the internal ideas themselves and aim to turn them into successful independent ventures. To this end, the team engages in prototyping and developing minimum viable products as well as proofs of concept. The following quote explains that, during implementation, new employees are hired and a whole team is built over time:

> *"It's usually like 2 or 3 developers, who just sit down and start building the product. (...) Then I find the lead, they manage the developers, then I help that lead hire (...) people who work with them. (...) And then we actually grow as a team and it's usually like 10 people fairly quickly, who, then, as a group build the product."* (Nu)

4.1.6 Mediated Corporate-Startup Interaction

Established corporations and startups exhibit very different corporate cultures, which naturally constrain the degree of interaction occurring. While corporate incubators, and particularly accelerators, actively seek to promote exchange and collaboration between the two worlds, this goal plays little role in company builders. Company builders keep an eye open and sometimes, if they fit, engage in partnerships with startups. However, fostering such collaboration is not an explicit goal, as the following quote highlights:

"Our own ideas take center and all partners that fit, fit. – May this partner grow with us or not." (Mu)

Corporate incubators and accelerators initiate interaction and make sure it will happen smoothly, by means of event management, active relationship management, or cooperation management. These three identified first-level categories, which underlie the process of CVU mediated interaction, are shown in Figure 7.

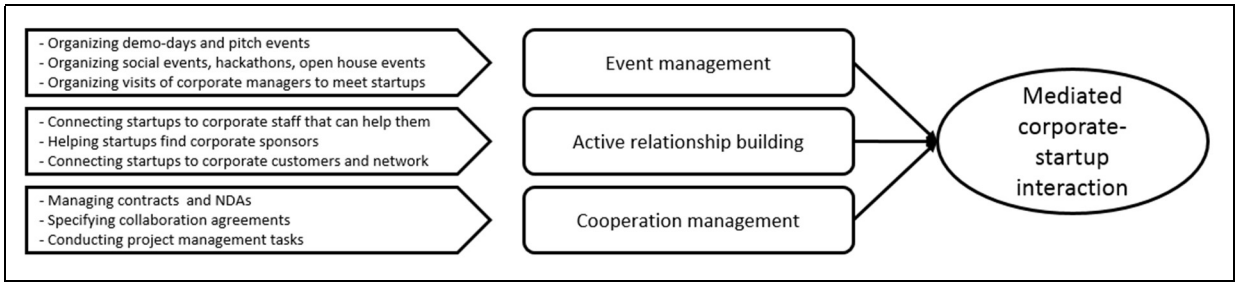

Figure 7: Coding structure for "Mediated corporate-startup interaction"

Event management. CVUs frequently organize socializing or topic-specific events as a platform for startups and corporate people to mingle and start dialogue. For instance, one interviewee told us that they frequently host events, where they invite sector experts to hold presentations on topics of interest to both corporate and startup personnel. Moreover, some CVUs organize open house events or scheduled visits for corporate employees and managers to come over and to get to know the startups. Corporate accelerators appear more systematic

in this process than incubators, as they offer a greater variety of events with different scopes and a focus on speeding up relationship building. In addition, accelerators typically organize pitch events at the beginning and demo days at the end of their program.

Active relationship building. Company builders rarely engage in active relationship management, which is another fundamental aspect of mediated corporate-startup interaction. Other CVUs, however, actively moderate relationships between people in both the established company and the startups. For instance, CVU staff can open doors for startups by bringing them together with potential corporate sponsors, who work together with a startup and could later become their client or customer. Further knowledgeable people in corporate business units include experts, who can provide relevant industry expertise or technical feedback. This provides valuable shortcuts, since otherwise it is very difficult to find and connect with the right people inside a large corporation. One interviewee described how they match startups with corporate staff:

"We have a database of all people who work innovatively, and at the beginning of the season, we go through every startup and consider: Who of these experts could be relevant for them? Then we do a matching and write to the experts and say "Hey, we think these teams are interesting for you. Which one would you like to meet for lunch or just come over?" Then they give feedback and we organize the first meeting." (Lambda)

Another important part of mediation on the part of corporate incubators and accelerators is to connect the startups with their own customer base through the corporate parent's network.

Cooperation management. After startups and established corporations have got in contact and both parties enter into more formal types of cooperation, the CVU often assumes the role of overseeing and managing this work relationship. Then, for instance, the CVUs carry out project management tasks, help to specify cooperation agreements, and manage contracts.

4.1.7 Direct Corporate-Startup Interaction

Activities of the CVUs often lay the groundwork for direct interactions between incumbent companies and startups. In the interviews with the CVU managers, we observed that, even though they did not participate in this interaction, they were clearly aware of these direct interactions. We identified three main types of direct interactions in case of corporate incubators and accelerators, which rarely happen in company builders. These three first-order categories underlying this process are shown in Figure 8.

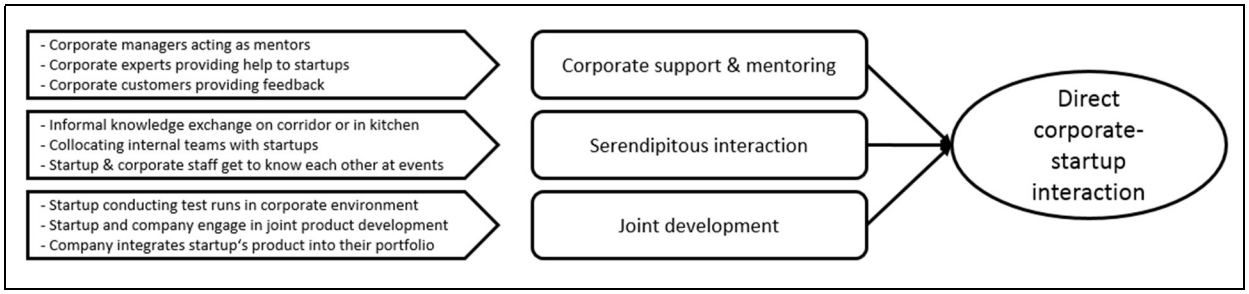

Figure 8: Coding structure for "Direct corporate-startup interaction"

Serendipitous interaction. One form of direct interaction happens by chance, when the startups are located in physical proximity to the corporate parent. For instance, such serendipitous interactions take place when corporate and startup employees bump into each other at the coffee machine, in the corridor or while smoking. For instance, one interviewee described how this kind of informal exchange could help their employees and the startup employees receive valuable feedback on particular issues:

"In the breaks, when they go out to get coffee or to smoke, whatever, they exchange with our engineers and then certain approaches to solve problems emerge. That is not only a benefit for the startups, but also a clear benefit for us, because new ideas and approaches are instilled in the heads of our settled employees as well." (Alpha)

Moreover, startup and corporate employees meet randomly at the above-mentioned events where they start entering into informal exchange.

Corporate support and mentoring. Sometimes startups need more specialized expertise, which goes beyond what the CVU team itself is able to offer as first-order support. In these cases, the startups may get in touch with corporate staff to ask them for advice. Corporate customers are also sometimes available and startups can involve them as focus groups and ask them for feedback on their early prototypes and minimal viable products. In addition, we often found that in accelerators, corporate managers often engage as mentors, either within a structured MBA-like program or within individual sessions with the ventures.

Joint development. The third form of direct interaction refers to collaboration in the context of joint projects, where staff from both corporation and startup collaboratively engage in product development. One interviewee described how close cooperation during product development led to a continued business relationship between the startup and the corporate parent:

> *They [i.e. the startup] were really every day, or once a week, in the factory and developed their product further with the blue-collar-workers, so that it was adopted eventually so well that the blue-collars said "Cool, we want to work with this!"* (Lambda)

While startups often face difficulty finding an environment for testing their products or services, corporations can give them opportunity to test their products or services within the company as a real-life environment. If successful, the testing scenario can possibly be enlarged and more projects may follow.

4.2 Connecting Processes and Innovation Strategy

While most identified processes are common in all CVUs, we also recognize differences according to the type of CVU. We compare to which degree the processes are expressed in each type of CVU in Table 2.

Table 2: Comparison of processes in different CVU types

Process	Sub-Process	Incubator	Accelerator			Company Builder
			Own	CV-aaS	Own	
			Single parent	Sectoral	One sponsor	
		A B Γ	Δ E Z	H	Θ K Λ	M N Ξ
Interfacing	Establishing institutional interfaces	Formal and informal	Formal and informal			Formal and informal
	Establishing personal interfaces	Yes	Yes			Yes
	Establishing spatial interfaces	Yes	None			None
Corporate Controlling	Agenda setting	Strong	Strong			Strong
	Controlling startup selection	Moderate	Decisive			n/a
	Controlling idea selection	n/a	n/a			Decisive
	Controlling startup / venture graduation	Moderate	Decisive			Decisive
Environmental scanning	Following relevant media	Little	Moderate			Moderate
	Interacting with ecosystem actors	Moderate	Strong			Strong
	Input evaluation	Little	Moderate			Strong
Pre-Selection	Marketing and startup attraction	Some	Strong			n/a
	Filtering startups	Moderate	Strong			n/a
	Generating and filtering ideas	n/a	n/a			Strong
Supporting venture growth	Providing infrastructure and tangible resources	Strong	Some			Some
	Monitoring	Weak	Intense			n/a
	Providing first-level support	Weak	Intense			n/a
	Connecting ventures to external actors	Some	Intense			Some
	Implementing internal ideas	n/a	n/a			Strong
Mediated corporate-startup interaction	Event management	Moderate	Strong			None
	Active relationship building	Moderate	Strong			None
	Cooperation management	Moderate	Yes			n/a
Direct corporate-startup interaction	Corporate support and mentoring	Some	Strong			Rare
	Serendipitous interaction	Frequently	Rare			
	Joint development	Moderate	Moderate			

Strategic functions:	**Strategic Search**	Passive exploration	Active exploration / exploitation	Active exploitation
	Strategic Selection	Realizing loose fit between startup-corp.	Realizing tight fit between startup and corporate	Realizing tight fit between idea-corp.
	Strategic Collaboration	Ad hoc, sporadic collaboration	Regular collaboration	Internal Venturing

We further find that the identified processes interlock in certain ways and thereby serve three core functions. These functions enable (1) strategic search, (2) strategic selection, and (3) strategic collaboration and thus contribute to corporate innovation strategy and help the CVU fulfil its organizational charter.

4.2.1 Strategic Search Function

As the identified process regarding environmental scanning showed, all types of CVUs are actively present in the startup ecosystem, although to different degrees. Accelerators, and even more so company builders, spend significant time researching and participating in conversations on where entrepreneurial activity is taking place, which new startups, technologies, or business models are emerging and which trends are beginning to show. In this context, these two types of CVUs acquire a sound, holistic understanding of developments happening in the startup ecosystem. In case of corporate incubators, this process is pronounced.

Simultaneously, all three types of CVUs engage in dialogue with corporate actors in order to build and maintain awareness of corporate needs. Through interfacing, the established company exerts a noticeable degree of corporate control so as to influence the CVU's agenda and direction of the environmental scanning process.

Based on this interaction with both sides, the CVU team matches themes and technologies emerging in the startup ecosystem with corporate needs, and identifies areas of overlap. Hence, in combination, the processes jointly fulfil a strategic search function, which is well exemplified by the following quote:

> *"Our strategy is: On the one hand, [we follow] the internal discussion: "What are your search fields?" (...) On the other hand, [we observe] "What is coming towards us from the startup-world?"* (Lambda)

The strategic search function is expressed differently in each type of CVU. The understanding of developments in the startup ecosystem as well as corporate needs and "pain points" is very fundamental for the work of company builders, which rely on in-depth research as a basis for their ideation activities. Also, while they implement their ideas, they continue to engage in conversations to get feedback, which helps them validate if ideas work out and may improve

their product. In contrast, we find that the strategic search function is hardly expressed in corporate incubators, which rather casually build up an understanding of trends and emerging technologies as they select and interact with (potential) incubatees. Accelerators are somewhere in between, depending on whether they follow a more explorative or exploitative approach (see section 5.2 below).

4.2.2 Strategic Selection Function

Knowledge gathered in the context of the strategic search function provides the basis for the pre-selection process. To this end, corporate incubator and accelerator teams address external startups with viable business ideas via marketing and PR efforts. In contrast, company builders seek to generate their own ideas through in-depth ideation sessions. In all cases, the flow of startups and ideas has to be filtered. The individual types of CVU present noticeable differences in terms of the intensity of this process. Both marketing and PR efforts and filtering of startups/ideas seems less rigorous for incubators, whereas this process is often more structured and competitive in case of accelerators and company builders.

Contemporaneously, corporate controlling also occurs through interfacing. CVUs present short-listed startups or pitch pre-selected ideas to the corporate parent, and thus reduce the complexity that corporate decision-makers have to face. Often corporate experts are asked for an evaluation and, finally, corporate managers are involved in the final decision. Thus, in combination, the processes jointly fulfil a strategic selection function to select the right startups and ideas. Here, the ubiquitous selection guiding criterion is the strategic fit, i.e. whether supporting and engaging with a specific startup, or pursuing a certain venture, contributes to realizing the strategic objectives of the established corporation. This is best exemplified by the following quote from our interviews:

"The question is: Does it fit? Do they have an idea, a product, a problem to solve that fits to our target direction […]? It may be a good team, but if it doesn't fit the focus, then it doesn't make sense if they're here with us." (Theta)

In addition, the strategic selection function is expressed differently in each type of CVU. While realizing a tight strategic fit between ventures and the corporate parent is crucial to accelerators and company builders, incubators take a broader approach and also accept more loose fits.

4.2.3 Strategic Collaboration Function

Corporate incubators and accelerators seek to promote strategic collaboration as a means through which, on the one hand, the corporate parent can benefit from the innovativeness of startups. On the other hand, the supporting venture growth process covers typical incubation and acceleration elements, whereby startups benefit from access to the unique assets of the established company. Therefore, an important process in CVUs is mediating interactions between startups and corporate parents so as to initiate exchange between both sides and make sure that collaboration runs smoothly. Then, direct corporate-startup interaction takes place through serendipitous encounters, if corporate managers or experts give advice to startups or they jointly develop something.

This stands in stark contrast to what we observe for company builders. They keep an eye open for partners and only occasionally engage with startups as an implementation partner. Hence, fostering collaboration is not an explicit goal of company builders, as the following quote highlights:

"Our own ideas are in the center and all partners that fit, fit. – May this partner grow with us or not." (Mu)

In case such partnerships are formed, company builders do not connect startups with the corporate parent. Also, the company builders‘ own ventures rarely interact with the corporate parent. Rather, company builders try to insulate the ventures from the corporate culture and path-dependencies, which is comparable to the classic skunkworks model. However, ventures still benefit from the resources of the corporate parents and company builders might reach out to the corporate parent and request additional resources and expertise or let ventures utilize the corporate parent’s customer base.

The strategic collaboration enables different contributions to corporate innovation strategy. However, and in line with the previous functions, this function is also expressed differently according to the CVU type. Concretely, the support of corporate incubators is strategic in that it allows with relatively low engagement and risk to realize spontaneous knowledge exchange during the incubation period as well as sporadic, ad hoc collaborations after the incubation period. By contrast, company builders’ support to their ventures’ growth is strategic in that it enables classic internal venturing in that the successful ventures possibly become new organizational units of the corporate parent in line with its innovation strategy. Accelerators, by contrast, can enable both, strategic post-incubation collaborations as well as external venturing.

4.2.4 Bringing CVU Functions into a Holistic Framework

The strategic functions enabling (1) strategic search, (2) strategic selection, and (3) strategic collaboration build on each other. The strategic search function feeds into the strategic selection function, as a core understanding of developments in the startup ecosystem on the one hand, as well as corporate needs on the other is essential to determine possible strategic fits. Through the strategic selection function, the CVU is then able to support the corporate parent in finding startups and ideas, which may acquire strategic relevance for the corporate

sponsor. Finally, both functions lay the basis for the strategic collaboration function. In corporate accelerators and incubators, collaborations with selected startups are realized, thereby contributing to corporate innovation strategy. In company builders, no such exchange between external startups and the corporate parent is intended. However, their own ventures, which may later become integrated into the corporate parent, benefit from access to corporate resources. In Figure 9, we present a visualization of our theoretical framework, which shows how the processes connect to each other and to the strategic functions.

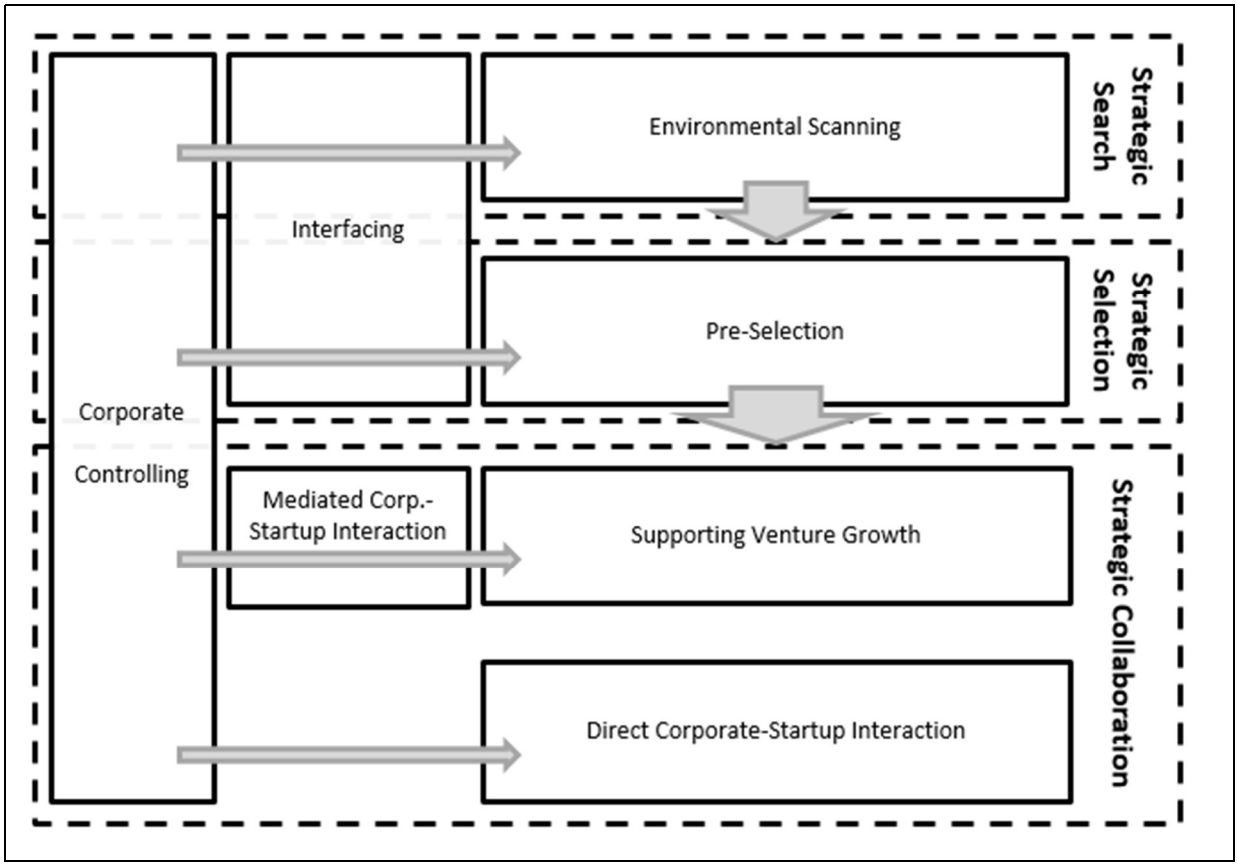

Figure 9: Proposed theoretical framework of CVU processes and their functions

5 Discussion

5.1 CVUs Contribution to Corporate Innovation Strategy

Through this interaction the incumbent company can in several different ways benefit from the creativity and agility of startups and strengthen its own innovativeness.

Experimenting with new technologies. A problem in established companies, which hinders innovation, is that corporate culture is perceived as risk-averse and that employees fear failure and have little incentives to try something new. Thus, the CVUs themselves create an environment - in an interview the term “sandbox” was used – in which risk-taking is not only important, but even “celebrated”. Such failure-tolerant environment provides conditions for free-thinking and experimentation. Startups and internal ventures prototype, build minimum viable products, test, and show them to the corporate and outside world to get feedback. Thereby, new technologies are evaluated on a small scale with limited cost. It allows the established company to validate and find out if technologies work and draw conclusions to what extent these have relevance to the corporate parent. One interviewee explained that dealing with startups finally helps the corporate parent to understand how their industry will develop in the future:

“I want to find out whether the startups are important for me, for my technology development, for my trends, for my future in the industry.” (Lambda)

Learning from startup culture and mindsets. Startup culture is shaped by less hierarchical ways of communication as well as a lower degree of formality (e.g. expressed in people wearing more casual outfits), lowering the barrier for exchange and collaboration. As one interviewee explained to us, startup employees often have more fun during work and since they are less tied to the classical 9-to-5 schedule, they are more flexible and willing to work late when tasks needs to be accomplished urgently. Oftentimes startups have a more open-minded, international atmosphere through high cultural heterogeneity. In one of our cases, startups were located at the corporate site and as startup and corporate employees started to talk to each other, English became more commonly used in the corporate parent.

As startups are perceived as bringing inspiration and “fresh thinking”, some established corporations see exchange with them as an opportunity to convey a bit of the startup spirit to

the corporate culture and rejuvenate it. Exposing corporate employees to the startup culture can help challenge fixed corporate mindsets, which can be an icebreaker for digital transformation and cultural change. In the case of the hybrid CVU in our sample, which combined accelerator and company builder elements, intrapreneurs working on internal ideas were collocated with external startups in the CVU as to promote cross-learning. One interviewee expressed this potential for opening the corporate mindset through a continuous corporate-startup interaction as follows:

"They [the corporate employees] see what we all could achieve if we would permanently work with these people that have no legacy, that have an open view on problems whilst the old people from the classic organizations are always in the narrow way of viewing the world." (Zeta)

Adopting more agile, user-centric and flexible methodologies and ways of working. Interacting and collaborating with startups also provides an opportunity for the corporate staff to get to know typical startup methodologies and ways of working. Common methodologies include, for example, agile development, Scrum, Kanban, Lean Startup Methodology, and user-centered approaches. Moreover, the way of working in many startups is characterized by a high degree of self-organization. Instead of a command-and-control management style, which is still common in many established companies, startups rely more on flatter hierarchies and self-managed teams that have autonomy to execute the tasks in the way they think it most expedient. One such management system is known as holacracy.

Integrating new products and services. All CVUs seek to support startups or respectively internal ventures to successfully develop new innovative products and services. If ventures fulfil the corporate expectations, there is the possibility to continue business relationships with the startups as suppliers or customers or business partners. In some cases, an acceleration period served as an intense due diligence for potential later investment by the corporate venture capital vehicle. In the case of company builders, ventures may become business units

in the corporate parents. Integrating the startups' or ventures' product or service can help the established company improve their own product portfolio and market offering and provide added value to their customers. One of our interviews reported an example, where the corporate team had difficulties finding a technical solution, which was then provided by a startup.

5.2 Exploration and Exploitation in CVUs

We observe that some CVUs follow more exploitative approaches, while others have a rather explorative approach. These orientations also manifest themselves in the three strategic functions.

We could identify subtle distinctions in regards to the information and knowledge search function. Some CVUs are more oriented towards the exploitation of existing knowledge, while others were following a more explorative approach. More exploitatively oriented CVUs tend to have a rather narrow topic focus in their approach focusing on business fields that are close to the corporate parent's core business. We found this to be the typical orientation of the company builders. By contrast, CVUs with a rather explorative orientation feel more pressure to respond to sudden, possibly disruptive changes in their sector. These kinds of CVUs take a broader perspective as to understand trends and upcoming changes happening not only within, but also at the periphery of their sector as well as neighboring ones. In addition, they also tend to consider a longer, more "visionary" time perspective trying to really understand how their sector will develop in the future.

Regarding the strategic selection function, again, differences between CVUs with more explorative versus more exploitative CVUs come to light. CVUs that follow a rather exploitative orientation prefer to select startups that relate rather closely to the core business of the incumbent company. In contrast, CVUs that follow a more explorative orientation tend

to preferentially select startups with ideas that are still in the stealth mode or startups that work on possibly disruptive technologies. This allows the established company to find out what is happening at the periphery of their sector and to spot possible disruptions early on. Such CVUs would even select startups that might attack their own business model, cannibalize their products or services or cut them off from customers or suppliers. As one interviewee expressed this as follows:

"If tomorrow a startup comes and says "We'll make [corporation] superfluous". If all criteria are met, I will say "Of course we'll do that!" And the chance for [corporation] is to look at it and talk to them and see if it is really possible and to perhaps draw early conclusions. But stopping it is not an option." (Zeta)

We were able to identify subtle distinctions also regarding the strategic collaboration function. Corporate accelerators and incubators that follow a rather exploitative orientation prefer to collaborate with startups that have potential to become future suppliers or customers of the corporate parent. Integrating their products and services amplifies the established firm's own product-market range. Moreover, it can help even an established corporation generate leads and additional revenue. We also found that the idea of some measurable financial return on investment was most notable in company builders, where profits were sought after in the long-term establishment of new business units. In comparison, CVUs with an explorative orientation put stronger focus on experimenting and evaluating new technologies.

6 Conclusion and Outlook

6.1 Theoretical Contributions

The aim of this study was to identify core processes in different types of recent CVUs as a basis for understanding their role in the context of corporate innovation strategy. Hence, with our results, we contribute to three literatures.

First, we add to the business incubation literature (e.g. Aerts et al., 2007; Cohen, 2013; Etzkowitz, 2002; Mian et al., 2016) in that we show the effects that an additional major actor has on the processes enfolding in business incubating organizations. Identifying distinct processes that enable the corporate parent to subtly, but decisively influence all phases of the CVUs operations, we add to recent studies that investigate the adoption of incubation and acceleration approaches in the context of corporate entrepreneurship (e.g. Kohler, 2016; Weiblen & Chesbrough, 2015).

Second, we add to the corporate entrepreneurship literature (e.g. Basu et al., 2016; Hill & Birkinshaw, 2014) in that we show the combination of distinct processes that are unique to these fairly recent types of CVUs. We show how these processes fulfil three core functions, which enable strategic knowledge search, selection of strategically fitting ventures and subsequent strategic collaboration.

Third, we add to the exploration-exploitation literature (e.g. March, 1991; O'Reilly & Tushman, 2008; Rosenkopf & Nerkar, 2001) in that we analyze how these functions help the CVU to fulfil its organizational charter in either a more exploitative or a more explorative mode. We thus add to a particular literature strand that investigates the exploration-exploitation balance in the context of corporate venturing (Basu et al., 2016; Schildt et al., 2005).

6.2 Limitations

Our methodology and our carefully collected in-depth, qualitative empirical data allows us a valuable glimpse at the processes between different types of corporate venturing units (CVUs) and how they are utilized to strengthen corporate innovation. However, our research design and data has some shortcomings that we have to point out. First, we conducted our interviews only with CVU executives and not with representatives of the startups or the corporate parent.

Hence, while our insights provide a detailed and accurate account of the inner workings of CVUs, we can only speculate on the effects that the CVUs' processes and activities have on the other two players in this triad. These effects have been out of the scope of this study, but understanding them is a very important next step in order to evaluate these processes. Second, the phenomenon is still nascent and thus several of our cases are very young units. No commonly accepted key performance indicators (KPIs) exist yet and temporary measures of CVU performance are very rough proxies. On the upside, however, this is an indication that there is much to learn in this area and qualitative analysis is very useful in such a context.

6.3 Future Research

Due to the lack of KPIs the investigation of the effectiveness of the above identified processes was not possible and remains to be a subject for further research. We do not know if CVUs live up to their expectations in the medium to long term. For instance, corporate incubators and accelerators compete with venture capitalists or other funders for the best startups. However, the venture that is (financially) the best choice for VCs and other private investors, is not necessarily the strategically most promising one from the perspective of the corporate parent.

Given the young age of the CVU types we study herein, we also do not know enough about what happens after the startups move out of the CVU and the long-term success of the startups/ventures as well as the impact on the innovation performance of the established company. Open questions, for instance, include: How is knowledge absorbed within the established corporation and how many products are successfully integrated in the product and service portfolios of the corporate parents? How sustainable are the cooperations between established companies and startups? How many ventures become integrated as new business lines within the established corporation?

In this study, we have focused on the mediating role of CVUs, helping established firms to engage in exchange and collaboration with startups. However, CVUs offer plenty of benefits to startups/ventures and they in turn benefit from the in-depth expert knowledge and industry expertise (along with other corporate resources) of established corporations. Future research should investigate how these assets help startups grow and establish themselves successfully in the market.

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