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ABSTRACT

In search of the interrelatedness of innovation and internationalisation processes in entrepreneurial life science companies

This study is motivated by the question how resource scarce innovative entrepreneurial companies seek and leverage global resources. This study takes a resource-seeking perspective a step forward and suggests that resources that enable the entrepreneurial internationalisation are largely accrued from the early stages of entrepreneurial life; that is from the innovation development. Consequently, this study seeks to explain how innovation and internationalisation processes are interrelated in the entrepreneurial internationalisation. This main objective is approached through three research questions, (1) What role do inter-organisational relationships in innovation have in the entrepreneurial internationalisation process? (2) What kind of inward–outward links do inter-organisational relationships create in the resource-seeking-based entrepreneurial internationalisation process? (3) What kind of capability to collaborate forms in the interaction of inter-organisational relationship deployment? The research design is a mixed methods design that consists of quantitative pilot study and qualitative multiple case study of five entrepreneurial life science companies from Finland and Austria.

The findings show that innovation and internationalisation processes are tightly interwoven in pre-internationalisation state. The findings also reveal that the more experienced companies are able to take advantage of complex cross-border inter-organisational relationship structures better than the starting companies. However, very minor evidence was found on inward links translating into outward links in the entrepreneurial internationalisation process, despite the expectation to observe more of these links in the data. Combined intangible-tangible resource-seeking was the most preferred to build links between inward–outward internationalisation but also to develop competence to collaborate. By adopting a resource- instead of market-seeking approach, this study illustrated that internationalisation extends to early stages of innovative companies, and that in high-technology companies' potentially significant cross-border relationships have started to form long before incorporation. Therefore, these observations justified the firmer inclusion of pre-company history in innovative entrepreneurship studies.

The study offers a conceptualisation of entrepreneurial internationalisation that is perceived as a process. The main theoretical contributions are in the

areas of international entrepreneurship and in the behavioural process studies of entrepreneurial internationalisation and resource-based internationalisation. The inclusion of the innovation-based discussion, namely the innovation process, in the internationalisation process theories has clearly contributed to the understanding of entrepreneurial internationalisation in the context of international entrepreneurship. Innovation development is a central act of entrepreneurial companies, and neglecting innovation process investigation from entrepreneurial internationalisation leaves potentially influential mechanisms unexplored.

Key words: innovation; entrepreneurship; internationalisation; resource-seeking; process

TIIVISTELMÄ

Yrittäjävetoisten life science -yritysten innovaatio- ja kansainvälistymisprosessien yhteyttä etsimässä

Tämän tutkimuksen lähtökohtana on kysymys siitä, kuinka resurssiniukat innovatiiviset yrittäjävetoiset yritykset hakevat ja hyödyntävät globaalisti saatavilla olevia resursseja. Tutkimus laajentaa resurssien hankinta -näkökulmaa ja esittää, että yrittäjyysvetoisessa kansainvälistymisessä hyödylliset resurssit kertyvät enimmäkseen jo yrittäjyyden alkuvaiheessa eli innovaation kehittämisen aloittamisesta. Tämän vuoksi tutkimus pyrkii selittämään, kuinka innovaatio- ja kansainvälistymisprosessi ovat yhteydessä toisiinsa yrittäjyysvetoisessa kansainvälistymisessä. Tutkimuksen päätavoitetta lähestytään kolmen tutkimuskysymyksen kautta: (1) Minkälainen rooli organisaatioiden välisillä innovaatiosuhteilla on yrittäjyysvetoisessa kansainvälistymisprosessissa? (2) Minkälaisia sisäisiä ja ulkoisia linkkejä organisaatioiden väliset suhteet luovat resurssienhankkimisperustaiseen, yrittäjyysvetoiseen kansainvälistymisprosessiin? (3) Minkälainen yhteistyökyvykkyys muodostuu organisaatioiden välisten suhteiden hyödyntämisen vuorovaikutuksessa? Tutkimusasetelmana on monimenetelmätutkimus (mixed methods), joka koostuu määrällisestä pilottitutkimuksesta ja laadullisesta monitapaustutkimuksesta, jossa kohteena on viisi yrittäjävetoista life science -yritystä Suomesta ja Itävallasta.

Tulokset osoittavat, että innovaatio- ja kansainvälistymisprosessi ovat tiukasti kietoutuneita toisiinsa yrityksen esikansainvälistymisasteesta alkaen. Lisäksi tutkimuksen havainnot paljastavat kokeneempien yritysten olevan valmiimpia hyödyntämään ulkomaisia monitahoisia yhteistyösuhteita aloittavia yrityksiä paremmin. Ennakoidusta huolimatta yrittäjyysvetoisen kansainvälistymisprosessin sisäänpäin suuntautuvien linkkien muuntamisesta ulkoisiksi linkeiksi saatiin vain vähän todisteita. Kansainvälistymisen sisäisten ja ulkoisten linkkien muodostumiseen vaikuttivat eniten resurssit, joissa yhdistyvät aineettomat ja aineelliset ulottuvuudet. Nämä samat resurssityypit olivat myös arvokkaita yhteistyökyvykkyyden muodostumisessa. Markkinoiden hankinta -näkökulman sijaan valittu resurssien hankinta -näkökulma paljastaa, että kansainvälistyminen ulottuu innovatiivisten yritysten ensivaiheisiin asti sekä sen, että korkean teknologian yrityksissä mahdollisesti merkittävät ulkomaiset yhteistyösuhteet ovat alkaneet muodostua kauan ennen yrityksen virallista perustamista. Nämä havainnot osoittavat tärkeäksi yrityksen esihistorian tiukemman sisällyttämisen innovatiivista yrittäjyyttä käsitteleviin tutkimuksiin.

Tutkimus käsitteellistää yrittäjyysvetoisen kansainvälistymisen prosessiksi. Tutkimuksen kontribuutio kansainvälisen liiketoiminnan tutkimusalueella kohdistuu kansainväliseen yrittäjyyteen ja nimenomaan käyttäytymis- ja resurssiperustaisten prosessien ymmärtämiseen yrittäjyysvetoisessa kansainvälistymisessä. Innovaatioprosessin kytkeminen kansainvälistymisprosessiteorioiden tarkasteluun auttoi ymmärtämään yrittäjyysvetoista kansainvälistymistä innovaation kehityksen alkuajoista asti. Innovaation kehitys on keskeinen tapahtuma yrittäjävetoisessa yrityksessä, ja innovaatioprosessin poissulkeminen kansainvälistymisen tarkastelusta saattaa jättää keskeisiä kansainvälistymisen mekanismeja kartoittamatta.

Avainsanat: innovaatio; yrittäjyys; kansainvälistyminen; resurssien hankinta; prosessi

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Espoo, March 2016

Nina Rilla

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1 INTRODUCTION

1.1 Background of the study

Innovation is an important value-adding element in businesses, societies and economies. The importance of innovations for long-term growth on the economic and company levels has been widely acknowledged (see, for example, Schumpeter 1963; Freeman 1994; Cantwell 1999), but innovation does not happen in a vacuum. Innovation happens in a system, often referred to as innovation system (Sundbo 1998; Archibugi & Iammarino 1999; Carlsson 2006). More importantly, innovation is generated by individual companies in all sizes and types in which entrepreneurs are acknowledged as the main leaders of getting innovations to the market (e.g. Schumpeter 1963; Sundbo 1998; Acs et al. 2001).

In some small countries, like Finland, the central challenge to the national economy and innovation system is a lack of rapidly growing innovative companies despite the high levels of technology and invention. The key question from the perspective of management and innovation policy is how to develop a dynamic and strong innovation-based growth environment for companies, as well as to create and promote entrepreneurship that is able to translate nationally developed innovations and technologies into prosperous international business. In order to succeed, not only are public incentives to foster growth entrepreneurship required, but also mind-set, motivation and capabilities from innovative entrepreneurs to engage in global innovation development are required. The latter, motivation-related aspects are often unfortunately left without proper focus in the innovation policy agenda. One of the reasons could be the outcome focus of innovation, which neglects the input side that is the dialogue between the innovation process and entrepreneurs (Garud et al. 2013). In the academic literature, this might translate into poor contextualisation of innovation (Garud et al. 2014).

Shortened innovation lifecycles, rapid diffusion of new technology and increasing multidisciplinarity of new technology are shaping business and, at the same time, the innovation environment (Forrest 1990; Narula 2004). In order to respond to these challenges, companies are often forced to look for external know-how and knowledge sources because of insufficient internal innovation resources (Howells 1999; Tether 2002; Howells et al. 2003; Howells et al. 2008). Yet, these important sources often reside outside national borders. In

order to survive, companies must open up their innovation process and enter the global innovation networks either through setting up their own research and development (R&D) unit or forming R&D cooperative alliances with external partners (Kotabe & Swan 1995). Therefore, companies' internationalisation and competitiveness depend essentially on their ability to take advantage of the international arena of technology and knowledge. To source and develop overseas technology and knowledge, the resources have to be accessed, exchanged, created or replicated in inter-organisational transactions (Mathews 2002). Because of the importance of innovation to economic growth, public policies are designed to encourage and facilitate inter-organisational technology, knowledge diffusion and global innovation (Cantwell 1999; Archibugi & Iammarino 1999; Lindholm Dahlstrand & Stevenson 2010).

Knowledge and learning-based competencies are indeed important resources for enhancing companies' competitive advantage (Nelson & Winter 1982; Penrose 2009[1]). Even though small businesses have been criticised for relying strongly on local partnerships and being dependent on local know-how (Freel 2003; de Jong & Freel 2010), access to overseas know-how is valuable for smaller ventures as well (Rilla & Squicciarini 2011). Companies are increasingly exposed and forced to respond to the influences, opportunities and threats of international business earlier in their lifecycle than before (Jones 2001). From the beginning, many young innovative businesses operate in an international context without a domestic market (Yli-Renko et al. 2001; Coviello 2006), and companies are engaged in international innovation development long before the company is officially incorporated (Jones 2001). Therefore, research- and production-related cross-border business activities are integral parts of the entrepreneurial internationalisation process in small companies (Jones 2001).

Seeking and leveraging resources globally has become an important activity of entrepreneurial companies. The rather recent evolution of globalisation of innovation development makes the study of innovation and internationalisation of entrepreneurial small enterprises highly topical and an important research area (Gabrielsson & Gabrielsson 2013). An innovative high-technology business context offers an interesting setting to study international entrepreneurship as companies in this context seek international growth from their founding and enter the international markets quickly (Jones 1999; Yli-Renko et al. 2001, Yli-Renko et al. 2002; Styles & Genua 2008). In addition, they develop capabilities to adapt to the international resource arena early on (Zahra et al. 2003; Knight & Cavusgil 2004; Tolstoy & Agndal 2010). An important task for today's management and policy practices is understanding the

[1] *The Theory of the Growth of the Firm* by Edith Penrose first published in 1959.

micro processes underlying innovation at the system level. For this reason, this study focuses the lens inside a company to examine its micro processes and determine how resources are sought and deployed as well as what kinds of competences are needed in resource-seeking internationalisation in the innovative entrepreneurial companies in the life science field. Entrepreneurial companies, whose business is based on high-technology innovation, potentially create their competitive advantage by deploying unique resources from multiple countries (Oviatt & McDougall 1994; see also Barney 1991). Therefore, cross-border resource accumulation and deployment may provide a more accurate picture of internationalisation than concentrating on resource commitments in entering new markets (Hewerdine et al. 2014). Even more important is to detect this development from the early days of the entrepreneurial journey, which inherently starts from the innovation.

This study adopts a Schumpeterian and evolutionary view on entrepreneurship (Schumpeter 1963; Nelson & Winter 1982; see also Chandra et al. 2009 for distinct views) which interlinks entrepreneurial behaviour and innovation activity. Therefore, this study is interested in innovation-based entrepreneurship in contrast to new-business-generating entrepreneurship (and intrapreneurship) which aims to create new business without technological innovations that create novel markets (Drucker 1985; Acs et al. 2001; Chandra et al. 2009; Autio et al. 2014; Garud et al. 2014). Following this argumentation, innovation and entrepreneurship are perceived as two inseparable activities of an international entrepreneurial company, whose aim is to develop and launch innovations in the global context, and who has possessed a global mind-set since the beginning. Companies such as those suggested by the international entrepreneurship (IE) approach (Oviatt & McDougall 2005) that recognise opportunities in the global environment from their inception are international entrepreneurial actors. Given the strong innovation-based ‘world-view’ of the study, it is worth introducing the innovation concept as the main motor of entrepreneurial internationalisation. This is done in the context of the life science sector.

1.2 Innovation in the life science sector

Innovation as a concept is not straightforward and is often evaluated in the disciplines differently. As a result, innovation is unfortunately often left in research without a solid definition (Mathews 2002). In organisation studies, innovation can be understood broadly to refer to any new idea that has emerged in an organisation (Gupta et al. 2007). Alternatively, it might take the form of a firmer definition which concentrates on tangible and commercial

aspects of innovation (see, for example, Schumpeter 1963; Nelson & Winter 1982 for the innovation and evolutionary economics perspectives). This can mean, in Schumpeter's terms, commercialisation in the market by a business or the equivalent (Schumpeter 1963; see also OECD Oslo Manual 2005), or diffusion to other parties beyond the discoverers (Rogers 1983; Garcia & Calantone 2002). Yet, the crucial factor in innovation is that it creates change – innovations are "new combinations" (Schumpeter 1963; Drejer 2004). Innovation hence contains a high level of uncertainty and can be understood as "*the first application of an invention*" (Sahal 1981, 41). In this study, I follow the definition proposed by Schumpeter (1963) and the OECD Oslo Manual (2005) and define innovation as an invention that is commercialised on the market.

Schumpeter's typology covers five distinct types of innovations. The first type refers to the introduction of new goods, or a new quality of goods. This is commonly understood as product innovation. The second type of new combination covers new methods of production, which are denoted as process innovations (cf. Schmookler 1966). The remaining three types of Schumpeter's new combinations are of a more abstract nature (i.e. market, organisational and input innovation [cf. Drejer 2004]), as they go beyond the mere commodity. Service innovation was chiefly missing in Schumpeter's original work, even though discussions on service innovation are based on his thoughts (Gallouj & Weinstein 1997). One of the widely cited references in innovation studies is the Oslo Manual (OECD 2005) which recognises, following Schumpeter's footsteps, four types of innovation: product and service, organisational, process and marketing innovation. Service innovation is in this categorisation incorporated into product innovation. In this study, the central focus is on technological innovations, which are often materialised in the form of product innovations but which might incorporate service or process dimensions.

Besides the varying types, innovations are also sector- and industry-specific (Pavitt 1984; Malerba 2002). Industry-specific conformities, such as technology intensiveness and knowledge and skills sources, guide several innovation dimensions and especially the innovation development processes. These technological regimes steer the innovative activities in the sector (Nelson & Winter 1982). The technological regime specifies the types of problems companies are to solve in their innovation activities[2] as the intensity of innovation and the rate of firm entry in an industry vary (Malerba & Orsenigo 1997).

[2] "Innovation activities include all scientific, technological, organisational, financial and commercial steps which actually, or are intended to lead, to the implementation of innovations. Some of these activities may be innovative in their own right, while others are not novel but are necessary to implementation" (OECD Oslo Manual 2005, 18).

Consequently, low- and high-technology sectors have specific knowledge bases, technologies and demands. The context of this study, life science, is a highly technology-oriented and innovative field and is increasingly prone to opportunities for all kinds of innovations including local health and well-being service innovation. This study focuses, however, on the technological aspect of innovation and concentrates on studying technological product innovations.

Life science comprises sectors related to health and well-being that build on three main fields, namely pharmaceuticals, biotechnology and medical technology (e.g. Stremersch & Van Dyck 2009). The core technologies on which the sector builds are diagnostics, devices and both pharmaceuticals and biologics drugs (Eselius et al. 2008). Given its wide application areas, the life sciences field is often described as a key enabling technology field in which new opportunities build on the convergence of different technologies (Eselius et al. 2008; Jones et al. 2011b). The increase in life science-related research has been strong since the beginning of the 21st century, and new innovations have emerged through the interaction of fields outside the medical arena, like communication and information technologies (Rosenberg 2009). Yet, one of the most influential disciplines to the development of life sciences is physics (Rosenberg 2009). The basis of and requirements for innovation in each distinct field of life science are likely to vary, but there are similarities as well. For instance, the high regulative requirements and the public sector customer base steer the innovation processes in all aspects of life science. Despite the technology intensity, innovations in life science are often systemic rather than autonomous, as they are connected to a wider health care system.

As previously mentioned, the life science field poses many regulative aspects to innovation development and commercialisation (Stremesch & Van Dyck 2009; Dymond et al. 2012). Clinical trials are one of the most demanding factors in the successful completion of the innovation process. Depending on the class of the medical product, the firm needs to perform clinical trials in one to four phases. Having said this, it is clear that the effect of these trials and other regulations on commercialisation is immense as clinical trials are extremely costly and take a long time to perform. For some smaller firms, mainly in pharmaceuticals, clinical trials might turn out to be the breaking point if they fail to attract the necessary financial resources. Due to the investment intensity, the life science sector is fairly dependent on public policies, such as funding schemes and technology and knowledge transfer initiatives.

Since the mid-1990s, life sciences and biotechnology, in particular in Europe, have been seen as important areas to meet the upcoming challenges facing Europe in public health, clean energy and climate change. This outlook provoked a biotechnology boom in several European countries in the late

1990s and early 2000s, and Finland also experienced these immense expectations for this promising sector (Kulvik et al. 2013). In 2002, the Life Sciences and Biotechnology Strategy for Europe (ECC 2002) recognised the potential of these sectors, and outlined action points for instance to foster a knowledge base of basic and applied research to develop new applications, increase networking and collaboration, and improve public support. In the late 1990s, for example, a BioValley network in central Europe was initiated that includes more than 300 actors from private and public sectors (Giovacchini 2011). Although the biotechnology boom resulted in the establishment of technology parks and increasing biotechnology education around Europe, the expectations grew too high for this new field to meet, resulting in the eventual decrease of investments by 2010 (Kulvik et al. 2013). Biotechnology and life sciences in general suffered a small hiccup in reputation. One positive result of this downturn is that more experienced life science entrepreneurs are steering companies still today.

At the time of writing, the life science industry is at a lively stage. Some of the sub-sectors have already matured, like pharmaceuticals, but new innovative sub-fields emerge continuously. Life sciences plays an important role in the current Europe 2020 strategy to overcome the societal grand challenges of increasing health care expenditures, ageing of population, improved well-being, a greener environment and food security (European Commission 2015). In order to meet these challenges, Europe must still improve cooperative research and development (R&D) in the key areas to create new innovations. Regional hotspots and new investments are found in the life science sector around Europe. For example, in 2014, GE Healthcare opened its first health technology start-up campus in Helsinki called the Health Innovation Village. This initiative is to create an ecosystem for domestic health technology start-ups to help them innovate and grow.

New areas in digitalisation, like electronic and mobile health, offer opportunities to alert entrepreneurs operating in life sciences. At the same time, competition will increase as companies from other sectors, like consumer electronics, enter the market. According to the Deloitte Global Life Sciences outlook report (2014), health reforms taking place in many countries and transformation towards self-monitoring and preventive care are transforming the life science landscape for the upcoming years. However, tightening regulations in the United States (e.g. regarding Food and Drug Administration [FDA] approvals) and Europe (CE marking[3]) are creating concern in the life science sector (Deloitte 2014).

[3] "The letters 'CE' appear on many products traded on the extended Single Market in the European Economic Area (EEA). They signify that products sold in the EEA have been assessed to

Studies on life science innovation have shown that collaboration is a common practice in the field (Rothaermel & Deeds 2004; Kleyn et al. 2007; Renko et al. 2008) and partnerships are widely exploited to advance innovation (Lettl et al. 2006; Nosella et al. 2006; Andersson et al. 2013). As part of a highly knowledge-intensive sector, the life science companies must be close to the global knowledge frontier in the R&D phase, which turns the company's ability and capability to adopt the latest scientific results into a key factor for success (McMillan et al. 2000). Even the smallest entrepreneurial life science companies need to source technologies and knowledge from leading universities and to access potential collaboration partners on a worldwide scale constituting major drivers of internationalisation. Global presence is also important for preventing later obstacles and time delays because of different regulatory regimes (e.g. Stremersch & Van Dyck 2009). Although the formation of interfirm partnerships is seen as important to integrate technologies for new innovative products, effective cross-sector partnerships are not yet that common in life sciences (Eselius et al. 2008). Different innovation process timelines and tasks in different life science areas are said to be the hindering factors for effective collaboration (Eselius et al. 2008).

According to Peters and Young (2006), the exposure to external knowledge and international market varies considerably between different activities of innovation in life science (see also Renko et al. 2008). Discovery is often purely domestic, but involvement of external knowledge increases as the innovation process progresses, i.e. to clinical trials and commercialisation. Given that life science is a relatively young sector, many of the firms in the field are emergent and run by inventors since the majority of the new companies spin off research that originates in universities or institutes of technology. Intense university–private sector cooperation is required because of the strong focus on basic research and scientific discoveries (Rosenberg 2009). Consequently, many life science firms are concentrated around local science parks and universities, and partnerships between universities and industry are common (Kleyn et al. 2007; Gertler & Vinodrai 2009).

The life science market (pharmaceuticals, biotechnology and medical technology) is expected to grow in the upcoming years, which makes it one of the future important areas in many European countries. The largest markets are found in North America and Asia, to which European companies aim to get access. According to the "Life Science Outlook" report by Deloitte (2014), pharmaceuticals showed growth in market revenue of 2.4 percent from 2011 to 2012, biotechnology increased 9.6 percent during the same period, and medi-

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meet high safety, health, and environmental protection requirements." Source: http://ec.europa.eu/growth/single-market/ce-marking/index_en.htm (retrieved 3.3.2016)

cal technology has had an annual 7 percent growth in market revenue between 2005 and 2012. All three cornerstone sectors of life science show prosperous growth figures for the upcoming years as well, and the main growth markets are expected to be found in Asia (India, China, Indonesia), Mexico and Russia while North American and Western European demand for life science products is expected to slightly decline (Deloitte 2014).

Furthermore, the life science industry is expected to offer a strong foundation for innovation and economic growth in many regions and nations, and it is also expected to bring employment (Gertler & Vinodrai 2009). In 2007, life science industries (biotech, medical devices and pharmaceuticals) employed 1.31 million people, representing 0.75 percent of European employment (Giovacchini 2011), but the industry shows positive signs of growth as employment in EU-27 Member States increased by 2.1 percent between 2004 and 2009 compared to the total European employment increase of 3.3 percent during the same period. Many of the innovative life science companies start as entrepreneurial companies; in turn, many also remain entrepreneurial, which makes it interesting to examine these ventures' international growth journeys.

1.3 Internationalisation of innovative small businesses

Innovative entrepreneurial companies have been driven to the international environment since the beginning. As suggested by Oviatt and McDougall (2005, 7), international entrepreneurship (IE) in this study is understood as "*the discovery, enactment, evaluation, and exploitation of opportunities – across national borders – to create future goods and services*". The role of these cross-border opportunity-seeking innovative businesses in creating wealth and growth is strongly postulated in the literature (e.g. Schumpeter 1963; Acs & Audretsch 1988; Acs et al. 2001; De Jong & Marsili 2006). Therefore, it is justified to assume that the innovation-developing companies' entrepreneurial internationalisation behaviour is distinct to those whose offering is not, for instance, market disturbing or novel to the market in any way. Hence, the literature on high-technology-based small enterprises' internationalisation offers the main context for the present study.

Since innovative companies are expected to contribute to the technological change (Crick & Jones 2000) and launch innovations on the international market, it is also interesting to explore how these innovative high-technology companies reach foreign markets by examining market entry modes, or how fast they internationalise (e.g. Burgel & Murray 2000; Zahra et al. 2000; Yli-Renko et al. 2002; Crick & Spence 2005). From this literature, it is known, for instance, that innovative companies internationalise often quicker than their

non-innovative counterparts (e.g. Preece et al. 1998). It is also known that there is a relationship between innovation and export performance (e.g. Filipescu et al. 2013), and that the most favoured entry mode choices are exporting and using of distributors (Burgel & Murray 2000). There are, however, some discrepancies in the results. Given that internationalisation is a resource-demanding activity, innovations are not always immediately exported in small firms, as a study by Wakelin (1998) indicated. For a starting new venture, simultaneous innovation development and internationalisation are resource-demanding activities and are not always successfully attainable even if innovation is aimed at a global niche market. This description applies to life science companies which often are science-driven and struggle with the market to technology versus the marketing of technology approaches (Brännback et al. 2007).

Clearly, one of the grand themes in understanding the internationalisation of high-technology companies has been the network approach, which reveals that innovative enterprises extensively exploit business and innovation networks to reach international markets (e.g. Coviello & Munro 1997; Mort & Weerawardena 2006; Styles & Genau 2008; Tolstoy & Agndal 2010; Tolstoy 2010; Vasilchenko & Morrish 2011). The empirical evidence reveals that social relationships are important in internationalisation (e.g. Yli-Renko et al. 2002; Prashantham 2006; Partanen et al. 2008), but also that an international new venture (INV) development takes place in three interrelated levels that the venture manages via its networks (Mainela et al. 2011). Integrating the entrepreneurial level of developing opportunities and the innovation process to the international business level (Mainela et al. 2011) highlights the complex phenomenon of creating new innovative and internationalisation-pursuing companies.

In turn, specific literature has investigated strategies, patterns and processes of internationalisation in high-technology companies (e.g. Boter & Holmquist 1996; Rovira Nordman & Melén 2008; Gabrielsson et al. 2008; Gabrielsson & Gabrielsson 2013). Process studies often reveal the strong context dependency of the internationalisation process; for example, Boter and Holmquist (1996) emphasised this point when they compared traditional companies to their innovative counterparts. Fernhaber et al. (2007) raised similar concerns with the industry structure in the internationalisation of new ventures. The life science sector has in particular been indicated to hold unique characteristics, like a strong regulative environment that poses challenges, for example, to marketing (Stremersch & Van Dyck 2009). However, considerably fewer studies have specifically examined the internationalisation process, probably due to the lack of process studies in general (Welch & Paavilainen-Mäntymäki 2014).

One important aspect of small innovative companies' internationalisation is the integration of external knowledge and technological resources (Howells et al. 2003). The role of innovation networks has also been extensively addressed in the literature, but the relationship between innovation and international growth has been less explored in these studies. Very few of these studies have integrated an international dimension in innovation resource sourcing (see Appendix 1 for a review of SMEs' innovation collaboration). Internationalisation studies, in turn, have often approached external sourcing (knowledge or technology) from the network perspective or increasingly from resource- and knowledge-based views. Zahra et al. (2000) provided evidence of the relationship between capabilities and internationalisation by emphasising the role of increased competences to innovate in the international environment. Furthermore, Knight and Cavusgil (2004) highlighted that innovative companies develop specific knowledge and capabilities which support successful internationalisation. Saarenketo et al. (2004) supported these findings in the context of ICT, whereas Jantunen et al. (2005) emphasised the importance of capability reconfiguration in internationalisation. Given that collaboration is important, networking-related capabilities have also been seen as essential in managing internationalisation (e.g. Mort & Weerawardena 2006; Kocak & Abimbola 2009; Tolstoy & Agndal 2010). Companies need competencies to source, develop and utilise inter-organisational relationships in their internationalisation.

Researchers have described small companies overall as resource-poor, which has made resources an attractive research theme in the internationalisation of small innovative companies (e.g. Preece et al. 1998; Zahra et al. 2003). Studies have tended to look at how the access to and possession of appropriate tangible and intangible resources (e.g. finance or knowledge) influences internationalisation (e.g. Bloodgood et al. 1996; Autio et al. 2000; Tolstoy & Agndal 2010; Libaers & Meyer 2011), or how the combination of different intangible and tangible resources varies in product- and market-oriented international new ventures (Tolstoy & Agndal 2010).

Furthermore, committing resources to international expansion is another traditionally widely explored topic in internationalisation (e.g. Johanson & Vahlne 1977). Interestingly, the strategies and processes of sourcing resources for internationalisation in technology-intensive companies have been given less attention in the literature. The studies of Ahokangas (1998), Hewerdine et al. (2014) and Schweizer (2014) are exceptions in this regard, as these authors have emphasised the resource-seeking and accumulation side of internationalisation rather than simply the outward processes of how resources are utilised. In general, it is surprising that very few of the studies have addressed the inward side of internationalisation that offers an interesting perspective to

resource deployment in small companies. A study of the oil and gas industry by Keogh et al. (1998) revealed that internationalisation is often integrated to innovation because the inward procurement side is tightly integrated to the outward process of internationalisation. Novel innovations urge companies to internationalise, as discussed in a study by Andersson (2000) who distinguished three different entrepreneurial internationalisation strategies; marketing, technical and structural. The motivation and engagement in internationalisation of these entrepreneurs differ according to the type of innovation they are internationalising. Brännback et al. (2007), in turn, discussed the phenomenon in a biotechnology context and investigated the differences between market- and science-oriented strategies in born global firms similar to an innovation-based approach.

Some valuable studies are found in the field of inward and outward resource links in internationalisation (e.g. Korhonen et al. 1996; Jones 1999; Crick & Jones 2000; Jones 2001; Freeman et al. 2013). These studies have indicated that, in technology-intensive companies, the first cross-border activities are often inward, for instance importing or licencing technologies (e.g. Jones 1999; 2001). Although that inward approach seems to be linked strongly to the innovative and high-technology companies, the inward approach in contemporary internationalisation studies is still less common.

Given that internationalisation in international entrepreneurial companies means growth in an international context (Oviatt & McDougall 1994; Gilbert et al. 2006), it is an important topic in new international ventures and start-ups, and has attracted interest as well (e.g. Autio et al. 2000; Yli-Renko et al. 2002; Ireland & Hine 2007; Partanen et al. 2008; Gabrielsson et al. 2008; Gabrielsson & Gabrielsson 2013). These studies have focused on growth speed, the process used to achieve international growth, and networks. For instance, Chetty and Campbell-Hunt (2003) showed the importance of networks in managing sudden international growth in SMEs, as they argued that business networks are the only way to support explosive growth. Yet, papers of international growth focused on high-technology firms have been relatively scarce, and the operationalisation of internationalisation may not be clearly stated in the studies (see Appendix 2 for a review of selected high-technology SMEs' internationalisation literature). To sum up, empirical evidence has indicated that innovation and internationalisation seem to have a reciprocal relationship; in particular, internationalisation offers innovation benefits because more technological opportunities are available, but companies also benefit from innovation as they are better able to exploit international opportunities (Filipescu et al. 2009).

Considering the empirical evidence of high-technology and innovative companies' internationalisation behaviour, it can be stated that these are a

special group of actors given that the competitive advantage in internationalisation (e.g. access to market, speed or growth) is often centralised on their unique technological resource, namely an innovation. Still, internationalisation requires resources. Many of the studies have taken the resources in internationalisation as a given, without paying attention to how company-specific resources are created or utilised (e.g. Schweizer 2014). International entrepreneurship has offered a fruitful context to explore various entrepreneurial processes since the early days of venture (Oviatt & McDougall 2005). Consequently, the essence is to pay attention to the creation and development of an entrepreneurial international company not to treat internationalisation as an end result.

The micro processes underlying the distinct company characteristics are still less known. By adopting resource and capability perspectives to address the internationalisation process in innovative entrepreneurial companies, better assessment of cross-border behaviour at the initial stages of innovation development is achieved. Furthermore, adopting a process perspective gives room to explore how the cross-border resource-seeking behaviour relates to the formation of competencies and international growth in entrepreneurial companies. Innovations developed by high-technology companies are sold in international markets, but questions remain: How early do these companies actually engage in international activities? How do they seek and deploy resources to successfully manage entrepreneurial internationalisation? These questions reveal that the understanding of resource deployment and types of capabilities needed in innovative companies' internationalisation has not yet reached its peak, and more research in this field is encouraged (Vanhaverbeke & Cloodt 2006; Autio et al. 2011).

1.4 The purpose of this study

The objective of this study is *to understand how innovation and internationalisation processes are interrelated in entrepreneurial internationalisation.* Entrepreneurial internationalisation is defined as international growth taking place in an innovative entrepreneur-managed company. In new innovative ventures, internationalisation is mainly growth that takes place in an international context (Oviatt & McDougall 1994; Gilbert et al. 2006). This study takes the resource-seeking internationalisation perspective a step forward and suggests that the inter-organisational relationships that enable entrepreneurial internationalisation are largely accrued in the early stages of entrepreneurial life, i.e. during innovation development. This study extends the internationalisation lens to company founding and beyond to the origin of

innovation. It relies on the argument that innovation and internationalisation in an international entrepreneurial company should not be disentangled from each other since innovation is inherently an entrepreneurial act. Following Calof and Beamish (1995) in defining internationalisation as a process, entrepreneurial internationalisation in this study is manifested as a process that combines the innovation process and the internationalisation process in an entrepreneurial company, though these processes are traditionally separately analysed.

To discover and exploit cross-border opportunities, new innovative ventures require access to foreign resources from the first steps of innovation development. Internationalisation is seen as a state rather than an outcome, and it urges a firm to engage in resource-seeking strategy in internationalisation (Ahokangas 1998; Hewerdine et al. 2014; Schweizer 2014) to be an international entrepreneurial company. Thus, the study aims first to describe and understand the role of inter-organisational relationships in innovation development and to examine the inward and outward links these relationships create in the resource-seeking internationalisation of an innovative entrepreneurial company. Consequently, an inter-organisational relationship is seen as an informal or formal collaboration activity that aims at advancing the entrepreneurial internationalisation process. The main purpose of these relationships is to access external resources. These goals together address how the entrepreneurial internationalisation process takes place in an innovative entrepreneurial company, with the aim to provide improved understanding of the early period of entrepreneurial internationalisation. It is further suggested that pre-internationalisation is an important state in entrepreneurial internationalisation since several resources and organisational competences originate prior to the company's founding, and are rooted in the pre-history of the company.

Second, the study aims to explore the antecedents of competences in the entrepreneurial internationalisation process, via a specific company-level construct, namely the capability to collaborate. This capability is identified in the flux of innovation- and internationalisation-related resource-seeking in entrepreneurial internationalisation. The capability to collaborate is predicted to be an important competence in resource-seeking internationalisation; therefore, this study addresses the identification of its dimensions in entrepreneurial internationalisation.

The main objective of the study is approached through the following research questions,

- What role do inter-organisational relationships in innovation have in the entrepreneurial internationalisation process?

- What kind of inward–outward links do inter-organisational relationships create in the resource-seeking-based entrepreneurial internationalisation process?
- What kind of capability to collaborate forms in the interaction of inter-organisational relationship deployment?

Within the different innovation types (e.g. OECD 2005), in this study, attention is placed largely on the technological side; therefore, this study discusses mainly technological product innovations, but it does not disregard process and service innovations that are entangled with product innovation. The importance of the other types of innovations (e.g. organisational or market innovations) to economic and societal growth is acknowledged, and the concentration on technology-based innovation is purely driven by the empirical evidence of the study. Furthermore, the analysis is limited to inter-organisational relationships from the focal company's point of view and will exclude analysis of the network structure. This limitation is made because of the study's concentration on the company's internal micro-processes and the importance of the focal relationships in the starting entrepreneurial companies for resource-seeking internationalisation, not the whole network as such. Last, given that inter-organisational relationships are seen as important for entrepreneurial companies to succeed in international expansion, and for the sake of clarity of the research setting, this work addresses one organisational competence only, namely the capability to collaborate.

1.5 Theoretical positioning and contribution of the study

The theoretical home base for this study is international entrepreneurship (IE), as the main focus is on the resource-seeking internationalisation in innovative and entrepreneurial companies. IE is a suitable conceptual home base because of the strong focus on innovation and the premise of entrepreneurs as the originators of innovation (Schumpeter 1963). Furthermore, IE treats internationalisation as a condition to create competitive advantage and value instead of mere outcome. Subsequently, the study absorbs influences from the innovation process and the inward–outward internationalisation approaches to understand the entrepreneurial internationalisation process. The connecting theme in the search of interrelatedness of innovation and internationalisation is the resource- and capability-based view (Figure 1) that is operationalised through the constructs of resource-seeking and deployment and the capability to collaborate that, in turn, are based on inter-organisational relationships in the context of innovation and internationalisation processes in entrepreneurial companies.

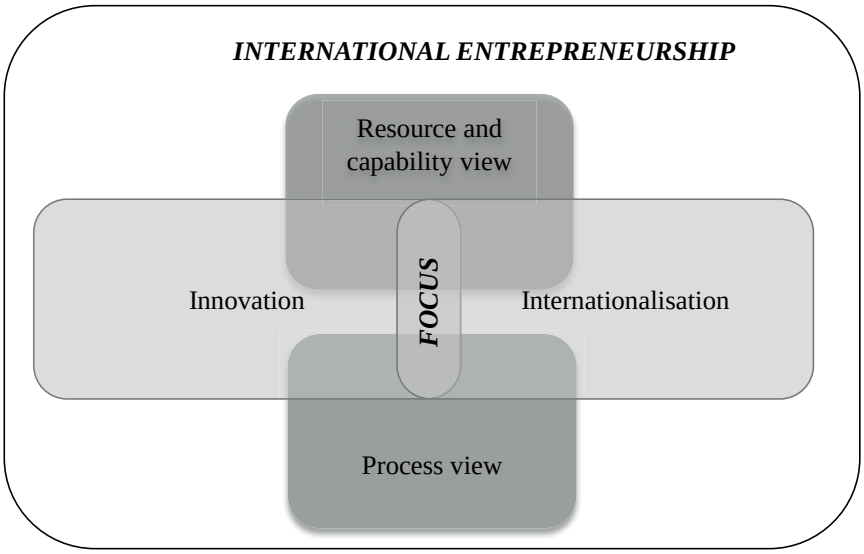

Figure 1 The positioning of the study

The chosen cross-border inter-organisational relationship perspective in resource-seeking highlights the international aspect of innovation and links the discussion to the entrepreneurial internationalisation process[4] of an innovative entrepreneurial company. Therefore, the main contribution of this study in the IE discipline is in taking a step forward in analysing two interlinked IE processes, namely innovation and entrepreneurial internationalisation. Although innovation creation is one of the most central processes of entrepreneurship (c.f. Schumpeter 1963), it has been only loosely defined and little investigated in the qualitative international entrepreneurship studies. Instead, many studies have concentrated on technology-based sectors rather than including innovation or the innovation process as a unit of analysis in the study (see discussion in Sections 1.3 and 2.2). This gap will be addressed in the present study by linking innovation to entrepreneurial internationalisation discussions.

This study supplements the understanding of the new venture internationalisation process by describing the antecedents of this process and the ability of

[4] While this study perceives entrepreneurial internationalisation and international growth as positive and rising, it is acknowledged that these processes in innovative entrepreneurial ventures vary, and often have characteristics of de- and re-internationalisation or nonlinear behaviour (e.g. Welch & Welch 2009; Kuivalainen et al. 2012; Freeman et al. 2013; Vissak & Francioni 2013). Yet, these backward and forward movements in the internationalisation process as such are not in the focus of this study.

an entrepreneurial company to pursue international growth in an inter-organisational resource context. Consequently, this study emphasises the micro-processes of an international entrepreneurial company, and contributes to *resource-based internationalisation* (Ahokangas 1998; Mathews & Zander 2007; Di Gregorio et al. 2008; Hewerdine et al. 2014) and *entrepreneurial internationalisation process* literatures (Jones 2001; Jones & Coviello 2005; Freeman & Cavusgil 2007; Jones et al. 2011a; Mainela et al. 2011). It furthermore contributes to literature closely linked to the resource view, namely capability literature (Montealegre 2002; Sapienza et al. 2006; Autio et al. 2011). The examination of the interrelatedness of processes in an international entrepreneurship context is complex, and hence demands multiple theoretical concepts and angles of investigation.

It has been argued that international entrepreneurship process studies are scarce (e.g. Melén Hånell et al. 2013), especially when it comes to understanding what cross-border activities take place during the early period of a new venture (Jones 2001; Mathews & Zander 2007). Studies that include simultaneous investigation of multiple organisational processes, or multiple levels of a process, are similarly in demand in the field of IE to understand better the antecedents and elements driving entrepreneurial internationalisation (Jones & Coviello 2005; Jones et al. 2011a; Mainela et al. 2011). Similar concerns have been voiced in innovation process studies, which lack rigorous process studies in small business innovation (Edwards et al. 2005) as well as an understanding of the micro-processes underlying innovation (Vanhaverbeke & Cloodt 2006; Garud et al. 2013).

Given that IE operates in the intersection of two disciplines, namely entrepreneurship and international business, it has been pointed out in the literature that the field still lacks sound theoretical foundations as studies often concentrate on one of the disciplines without relating these disciplines (Coombs et al. 2009), and that studies have largely been exploratory and descriptive which has left the theoretical and conceptual developments aside (Rialp et al. 2005). Although Jones et al. (2011a) answered the criticism of theoretical soundness by noting that IE as a discipline is very young and forming, others have claimed that IE still demands process studies to examine the entrepreneurial component which might reveal the early and entrepreneurially driven states of internationalisation as well as later entrepreneurial processes (Mathews & Zander 2007; Melén Hånell et al. 2013). This study will address this issue by developing a framework that extends the entrepreneurial internationalisation process to the initial phases of a company's lifecycle to innovation development and venture establishment. Therefore, this study introduces the concept of pre-internationalisation (e.g. Tan et al. 2007). Further entrepreneurial internationalisation states are also identified (namely

international development and commitment), but these states are used as tools to operationalise the process of entrepreneurial internationalisation rather than to study in detail the strategic decisions made in these states.

Second, this study analyses the entrepreneurial internationalisation process from the resource view, and steers the lens to resource-seeking and the search for interconnectedness to the innovation process. Previous literature suggests that sustainable internationalisation is achieved with the successful adjustment of resources (Ahokangas 1998). This process is claimed in the present study to start in the early stages of entrepreneurial life because the resources exploited in the entrepreneurial internationalisation process accrue from the beginning of the innovation process. For example, it has been suggested that entrepreneurs' previous experience from operating in foreign markets has a positive effect on internationalisation (Rovira Nordman & Melén 2008; Lindstrand et al. 2011), and the cross-border inward links in technology and production serve the down-stream value chain activities like marketing and distribution (Jones 2001, see also Jones 1999). Adopting a resource-focused process perspective on entrepreneurial internationalisation addresses the venture formation and early evolution of the innovation process, resulting in a better assessment of small company internationalisation than possible by concentrating on international growth alone (Hewerdine & Welch 2013). A holistic examination of early cross-border links in an inter-organisational relationship context might reveal resources and competences that contribute significantly to a company's later international development (Jones 1999).

Resource-seeking and deployment perspectives are not often exploited in internationalisation process studies because of the conventional concentration on outward, not inward processes (Jones 1999; 2001; Melén & Rovira Nordman 2007; Di Gregorio et al. 2008; Hewerdine et al. 2014). Following Hewerdine et al. (2014), this study argues that the resource search approach that investigates cross-border seeking and combination of resources may reveal a more accurate picture of the internationalisation of technology-intensive companies than the investigation of resource commitments to foreign markets would provide alone. A discussion of inward and outward links helps connect resource-seeking internationalisation to internationalisation process theories (e.g. Welch & Luostarinen 1993; Korhonen et al. 1996; Freeman et al. 2013). Furthermore, in a small innovative company, the progress of entrepreneurial internationalisation is often dependent on a small group of people, if not a single person, which justifies the use of an entrepreneurial lens in the investigation. The entrepreneur's role in seeking and realising cross-border opportunities should not be neglected (Oviatt & McDougall 2005). Given that business processes are complex, the analysis might require an understanding of more than one process; therefore, studies in an IE context are likely to

include more than one unit of analysis (Jones & Coviello 2005; Mainela et al. 2011; Melén Hånell et al. 2013), an approach adopted in this study as well.

In addition to the intended contributions to resource-based internationalisation and entrepreneurial internationalisation process literatures, this study aims to add understanding in the capability view by identifying the capability to interact in inter-organisational relationships. In this study, resource and capability views are believed to be strongly linked, resulting in the foreseen contribution to the capability literature arising specifically from the resource-seeking context of entrepreneurial internationalisation. Researchers in the IE capability field have argued that the formation of capabilities and their role in entrepreneurial internationalisation are still unexplored (Mathews & Zander 2007; Autio et al. 2011; Jones et al. 2011a), and that understanding of the capabilities in an international collaboration context deserves further analysis (Mort & Weerawardena 2006; Tolstoy & Agndal 2010). It has also been pointed that the entrepreneur's role is overlooked in capability formation (Weerawardena 2003; Weerawardena et al. 2007). The adopted research approach opens an avenue to identify antecedents of new entrepreneurial ventures' competences which provides understanding of the emergence of capabilities. These kind of micro-process-focused examinations are argued to be informative as they provide understanding of the origin of organisational routines on which capabilities can form.

In addition to the theoretical contributions, this study is expected to strengthen the knowledge of management and policy-makers concerning the economic activity of international entrepreneurial firms as it identifies sources for growth and competitiveness that stem from international innovation activities. The life science field is one of the most internationally networked in innovation that is likely to offer learnings and best practices for managers in other sectors as well. Due to the many current policy activities to bond innovative small businesses to the international innovation arena, this study is to provide information for decision-makers on the activities of companies in this context. The study will provide in-depth information on how small companies access international technology and knowledge resources, as well as how they utilise and translate these tangible and intangible resources in their innovation and business operations to internationalise. In addition, this study sheds light on the commercialisation and internationalisation of innovation, which are important but challenging activities to address with innovation and entrepreneurship policies. As a result, the study will produce more targeted policy incentives for international entrepreneurship in the entrepreneur-led companies active in cross-border innovation relationships and those who pursue international growth. In addition to policy implications, the study will present managerial implications to internationally operating entrepreneurial companies

which are foreseen to form in the area of inter-organisational relationship management.

The study is organised as follows. Chapter 2 discusses entrepreneurial internationalisation from both the process and resource perspectives, and addresses collaboration in the innovation process. It first introduces the main concepts of the study and provides working definitions, and the chapter finishes by presenting a tentative framework of the study. Chapter 3 presents the research methodology of the study and an evaluation of the research. Chapter 3 also offers the results of the quantitative pilot study. Chapters 4 and 5, in turn, illustrate first the findings of the case research and move on to discuss the main results of this study. Chapter 5 also provides a revised framework of the study. Chapter 6 is reserved for theoretical, managerial and policy implications, as well as suggestions for future research and limitations of the study. Finally, Chapter 7 summarises the study objectives.

2 ENTREPRENEURIAL INTERNATIONALISATION

2.1 Internationalisation in entrepreneurial companies

Internationalisation is a vast concept that needs a clear definition. Here, internationalisation is regarded as an evolutionary activity: "*the process of adapting firms' operations (strategy, structure, resource etc.) to international environments*" (Calof & Beamish 1995, 116). The definition includes ventures that start with an international presence, as in international entrepreneurship, as well as external and internal links in internationalisation (cf. Welch & Luostarinen 1993). This study concentrates specifically on entrepreneurial internationalisation, which is based on a resource-seeking approach and employs inward and outward links to adapt a company's activities to the international environment.

Growth in international entrepreneurial companies can be seen as innovation-driven because entrepreneurs exploit cross-border opportunities, whether ideas, resources or markets related to innovation (Acs et al. 2001). Innovations are increasingly developed in cooperation with inter-organisational partners in global technology and knowledge networks, which suggest companies connect to the international environment prior to founding and, depending on the length of the innovation process, long before the first actual international sales from which internationalisation is traditionally understood to begin (Jones 2001; Hewerdine & Welch 2013). Entrepreneurial opportunities that span across national boundaries, such as the market needs of international customers, collaboration with important international partners, or the actions of competitors are driving companies to be active on lead international markets (Dimitratos et al. 2010). The international presence is even more important for the innovative ventures that seek to launch their innovations on global niche markets (Beise 2004). However, given that many activities are connected to the international arena as early as the first ideas of innovation, for international entrepreneurial companies internationalisation is more a mind-set or state than an activity they deliberately pursue (e.g. Freeman & Cavusgil 2007).

2.1.1 International growth

In new starting ventures, internationalisation is largely exploiting growth opportunities on the international market (Oviatt & McDougall 1994; Gilbert et al. 2006). International growth can be approached from various perspectives, and hardly any of the selected alone is able to provide a holistic view that more often is requested in studies dealing with internationalisation (Fletcher 2001). In contrast to traditional growth studies that concentrate on sales (e.g. Yli-Renko et al. 2002) or employment growth (e.g. Garnsey et al. 2006), this study adopts a behaviouristic view. What this suggests is that this study is more interested in antecedents of and inputs in the growth process that allow entrepreneurial internationalisation to take place than analysing performance in the form of international sales or employment. For this reason, the study adopts a resource-seeking perspective instead of a resource-exploitation approach to internationalisation. Recent reviews (e.g. Jones et al. 2011a) and editorials (Coviello et al. 2011; McDougall-Covin et al. 2014) have pointed out that the IE field lacks understanding of the attributes of resources and capabilities in internationalisation even though resources are seen as the main enablers of extending to foreign markets and accelerating internationalisation.

Entrepreneurial internationalisation emphasises the integration of innovation development to the internationalisation of an entrepreneur-owned and -managed company. An entrepreneur's desire to grow and attitude of growth largely influence the growth path the company adopts. Management challenges in innovative companies are often found not in setting up a venture but in achieving and managing growth (Ireland & Hine 2007). A literature review by Gilbert et al. (2006) indicated that new venture growth is often dependent on favourable conditions, like the entrepreneur's motivation and the availability of resources that allow growth (e.g. technological leverage), as well as on industry conditions. In some industries, slow organic growth might be a better strategy, but in some venture capital-backed industries, fast growth is preferred. Albeit the liabilities of newness and smallness are related to new venture growth (Shelton 2005), a company may overcome these barriers through the creative use of resources and the development of capabilities. However, different tangible and intangible resource and capability endowments offer different growth paths (Penrose 2009). For instance, technological capability, financial capital, human capital and network capability have been identified as important resources in new venture growth (e.g. Gilbert et al. 2006; Chen et al. 2009). It is important to point out that growth adds organisational complexity, which might be difficult to manage in entrepreneurial companies (e.g. Mishina et al. 2004), arguably even more so if growth takes place in an international context. In life science, which is a highly technology- and

knowledge-intensive industry, companies' international participation in innovation to access scientific knowledge is a precondition and growth is sought from international markets because of the niche products they develop (Stremersch & Van Dyck 2009; Jones et al. 2011b; Melén Hånell et al. 2014).

This study integrates arguments from two different theoretical perspectives to explain the entrepreneurial internationalisation process. On the one hand, international growth is seen as a resource-seeking process which requires continuous matching of observed opportunities to available resources (Ahokangas 1998; Kuemmerle 2005; Hewerdine et al. 2014), including resources acquired via inward–outward links (Welch & Luostarinen 1988; Korhonen et al. 1996; Fletcher 2001) or accessed through partnerships (Coviello & Munro 1997; Coviello 2006; Freeman & Cavusgil 2007; Vasilchenko & Morrish 2011). The resource-seeking internationalisation is discussed in Section 2.3. Yet, for the matching of resources to achieve international growth, the capabilities to acquire and deploy these resources are fundamental. This view, although not addressed in this study directly, perceives capability development and deployment as important factors to achieve internationalisation (Sapienza et al. 2006; Autio et al. 2011). The concepts and approaches applied follow **the resource-based internationalisation** discussion (e.g. Oviatt & McDougall 1994; Bloodgood et al. 1996; Di Gregorio et al. 2008).

On the other hand, **behavioural internationalisation process theories** are applied to explain the entrepreneurial internationalisation process. In addition to the above view of internationalisation as an opportunity-based process, there are more established internationalisation theories which postulate internationalisation as a learning and experiential process (e.g. Johanson & Wiedersheim-Paul 1975; Johanson & Vahlne 1977, 2009), or theories that explain a company's export behaviour (Olson & Wiedersheim-Paul 1975; Leonidou & Katsikeas 1996). The latter theories tend to perceive the internationalisation process as a stage-based behaviour which in IE literature is a less favoured approach given that internationalisation in new ventures is often seen as fast, leapfrogging and dynamic (Freeman et al. 2013). The process nature comes rather from the continuous adjustments to changing conditions or opportunities (e.g. Johanson & Vahlne 1977; 2009).

The behaviouristic internationalisation theories, like process models, have their roots in Penrose's (2009) work of resource-based firm growth and in the behavioural theory of the firm by Cyert and March in the 1960s (Cyert & March 1992). In behaviouristic internationalisation theories, internationalisation is perceived as a process of incremental and experiential engagement in international operations to avoid uncertainty (Manolova et al. 2002). The experience, knowledge and learning of international operations increase

gradually, and assist companies to intensify their foreign activities in a gradual manner (e.g. Johanson & Vahlne 1977; 2009). Often these models see knowledge as one of the company's most valuable resources, as argued by Penrose (2009). When studying entrepreneurial internationalisation from a resource-seeking point of view, the behavioural models give a valid starting point to explain the early states of internationalisation.

2.1.2 Internationalisation as process

Although not common, some process models are found in the IE field. This stream of literature is still clearly evolving but has some important contributions to begin discussing the process of entrepreneurial internationalisation. For instance, a model by Freeman and Cavusgil (2007) proposed four different entrepreneurial attitudinal states instead of stages for enhanced internationalisation. In their model, internationalisation commitment is built on two dimensions, collective international orientation and global cognitive complexity, and the states develop from a responder to a strategist. The strategist is highly innovative and has a proactive and collaborative approach to internationalisation, whereas a responder shows only incipient interest in internationalisation. The proposed states are not intended to be followed sequentially; rather, states change dynamically according to changes in the environment or in strategic objectives that suggest a dynamic entrepreneurial internationalisation process. In general, entrepreneurial internationalisation process models have been mostly discussed in the growth process context (see Section 2.4 for a review), not from the entrepreneur's or managerial perspective as Freeman and Cavusgil (2007) proposed.

The internationalisation of entrepreneurial ventures is not limited to linear trajectories (Freeman et al. 2013). In the international entrepreneurship context and in life science in particular, the internationalisation process is rather seen as a behavioural process that has a cyclical nature (e.g. Jones & Coviello 2005; Johanson & Vahlne 2009; Mainela et al. 2011). This recursive nature is prominent in internationalisation because new ventures are simultaneously involved in several processes and because internationalisation is seen as a state, not a destination; as such, it requires continuous experience-driven commitment decisions, as proposed by Johanson and Vahlne (1977; 2009).

Jones and Coviello (2005) developed one of the most influential cyclical models in IE. As the most cited *entrepreneurial internationalisation process model*, this model contributes to the present study's framework. The main contribution is that the model operates in the intersection of two entrepreneurial processes. In this rather unique study, internationalisation is seen as a

time-based entrepreneurial process of behaviour, which is manifested in events and outcomes like fingerprint patterns created by internationalising companies. This entrepreneur- and entrepreneurial act-based (i.e. innovation) process creates evolutionary, irregular and unique internationalisation patterns and profiles, which incorporate the cyclical nature creating feedback learning loops in relation to change perceived in the external environment (cf. Johanson & Vahlne 2009).

Work by Jones and Coviello (2005) operated in an interesting area of IE by exploring two processes, namely the entrepreneurial process and internationalisation. Jones and Coviello (2005) suggested that the behavioural internationalisation process depends on the radicalness of the innovation process, which in the model is seen as an innovation related to international market entry rather than a technological innovation determining the market in which the company operates. Their general model of entrepreneurial internationalisation integrated two important dimensions of IE, time and entrepreneurial behaviour, and suggested constructs for developing more precise models (Jones & Coviello 2005). A network study by Mainela et al. (2011), in turn, integrated three interlinked processes in the development of international new venture. In their view, an international new venture develops in combination with a business opportunity; technology- and internationalisation-centred events and actions. These levels together create a cyclical network acting process for developing internationally operating ventures.

The cyclical nature is also present in the classic *Uppsala model* that highlights the experience and commitment decisions that steer the internationalisation process (Johanson & Vahlne 1977; 2009). Their dynamic revised model emphasised the role of relationships (i.e. networks), suggesting that an internationalising company is embedded in business networks that enable and constrain the company's internationalisation. They argue that learning, trust-building and commitment in internationalisation take place in relationships. Although the Uppsala internationalisation process model was not specifically developed for entrepreneurial firms, it suits to elaborate the role of relationships and resource-seeking internationalisation in new ventures as well, given that Johanson and Vahlne (2009) saw similarities in the opportunity-based entrepreneurial and internationalisation processes and acknowledged the relevance of social capital accumulated prior to the company's establishment. For their model as well, the history of the company matters. Furthermore, the process mechanism of the Uppsala model (i.e. learning and commitment cycle) is applicable to internationalisation process conceptualisations.

Following the thinking of Johanson and Vahlne (2009), the resource-seeking-based entrepreneurial internationalisation process can be understood to consist of two main components and be cyclical in nature (Figure 2). Entre-

preneurial internationalisation is pursued through the commitment of resources, the observation of international opportunities and the making of international commitment decisions. Resource commitments, which here are understood as inter-organisational relationships, increase with the accumulation of resource knowledge, which refers to the learning and experience gained of operating in inter-organisational relationships. For an international entrepreneurial company, opportunities are recognised in the cross-border context that in turn are materialised with decisions to pursue these opportunities (international commitment). As proposed by Johanson and Vahlne (2009), the entrepreneurial internationalisation continues as long as performance and internationalisation opportunities are favourable, which gives the process its cyclical nature in addition to the experience commitment cycle that encourages a company to seek resources for internationalisation. Companies can however exit the cycle as emphasised in the de- and re-internationalisation discussion (e.g. Welch & Welch 2009; Kuivalainen et al. 2012; Freeman et al. 2013), and possibly climb back in when cross-border opportunities are again prosperous.

Figure 2 Entrepreneurial internationalisation as process

Internationalisation develops as experience accumulates, which means certain internationalisation-related activities can be separated from the process. A study by Styles and Genua (2008) built on the original model by Jones and Coviello (2005), and separated an additional category of entrepreneurial internationalisation activity, namely pre-internationalisation events. Similar to Mainela et al. (2011), they also integrated networks in the model and claimed that network ties at pre-internationalisation shape international performance in starting companies. Chandra and Coviello (2010) made similar claims, proposing that pre-internationalisation plays an important role in the

resource and knowledge accumulation in internationalisation. Pre-internationalisation is indeed seen as important in the entrepreneurial internationalisation process, given its link to a company's history and innovation process, which will be addressed in Section 2.4.1.

The model by Jones and Coviello (2005) in turn emphasised an important aspect of entrepreneurial internationalisation, that is, the entanglement of different processes as many aspects of business (e.g. innovation, incorporation of the company, internationalisation) are developed simultaneously. In the life science context especially, certain requirements (e.g. technological and regulatory) in the innovation process set certain boundary conditions to the speed of internationalisation process (Dymond et al. 2012). If, like argued in this study, internationalisation and innovation processes are interrelated, the long and demanding innovation development process will determine the states of entrepreneurial internationalisation as well. New ventures could be seen to internationalise in a revolutionary manner, through relatively short changes that are determined by events in their internationalisation path (Casillas & Acedo 2013). This type of accelerated internationalisation entails re- and de-internationalisation movements, which can be the result of inward and outward activities (Freeman et al. 2013). Dependence on external resources is typical in life science companies (Warner & Carrick 2011) that might create dynamic (inward–outward) movements in the internationalisation process.

To summarise, the behaviouristic internationalisation process theories and more recent entrepreneurial behaviour approaches (e.g. Jones & Coviello 2005; Freeman & Cavusgil 2007; Mainela et al. 2011) offer valuable aspects for identifying and analysing the entrepreneurial internationalisation process. These emphasise changes in entrepreneurs' approaches and attitudes towards internationalisation and take into account the relatedness of different organisational processes as well as business and personal relationships. In addition to dynamism, this literature also highlights the cyclical nature of internationalisation. For these reasons, the behavioural internationalisation process theories are included as lines of literature that this study follows. These models acknowledge history and trajectories as important but not as the determining elements of the entrepreneurial internationalisation process; it is thus worth looking at what happens in another central process of an entrepreneurial company, specifically the innovation process, which allegedly begins at pre-internationalisation.

2.2 The innovation process

The innovation process is one of the central processes in entrepreneurial companies, and results in commercialised innovations. In new ventures whose business is based on science and high technology, the innovation development takes years and demands both great skills and enormous resources. Without innovations, ventures would perish, which makes understanding the dynamics of innovation and innovation processes crucial. Neither company growth nor innovation is a static phenomenon, but both proceed in time in combination with several actors and activities (Rosenberg 1982; Balconi et al. 2010) in a process that has identifiable activities. In this research, the innovation process is seen as an evolutionary process that combines intangible and tangible resources, like knowledge and capabilities, to create novel innovations (Nelson & Winter 1982; Henderson & Clark 1990). According to Teece (2009, 95), companies in the evolutionary view "*come with 'routines' or 'competencies', which are recurrent patterns of action which may change through search and learning*" (cf. Nelson & Winter 1982). The evolutionary view also highlights that the ability to develop and commercialise inventions is company-specific and cumulative, building on its past record, to routines (Nelson & Winter 1982; Teece 2009).

2.2.1 Source and novelty of innovation

One central characteristic of innovation is that a large share is built on existing inventions, or rather on a combination of inventions. In the words of Schmookler (1966, 57-58), "*inventions are typically induced by the intellectual stimuli provided by earlier inventions*". This thought, however, emphasises the action, i.e. the learning aspect of innovation, which centralises on the ability to take advantage of previously developed elements (e.g. Cohen & Levinthal 1990). Innovations are inherently created through communicating and combining knowledge (Rosenberg 1982; Henderson & Clark 1990; Kogut & Zander 1992) as well as firm capabilities (Nelson & Winter 1982; Penrose 2009).

Innovations can be assessed through various other dimensions besides differences in their types. Although taxonomies and definitions of innovation are largely overlapping and blurred (Danneels & Kleinschmidt 2001; Garcia & Calantone 2002), they do provide deeper understanding of the innovation development and commercialisation, which justifies a closer look at the innovation characteristics. Innovation processes are triggered by different incen-

tives, and the processes may vary considerably, for instance by sectors, as discussed in the context of life science in Section 1.2.

One way to classify innovations is to look at their socio-economic effects, such as their disruptiveness to the market, or the technological change pursued (e.g. Dosi 1982; Mowery & Rosenberg 1982). This typology emphasises the degree of novelty of the innovation and the degree of change it brings to the market and the industry as well as economy and society (Schumpeter 1963; Freeman & Perez 1988). Incremental innovations are said to occur continuously, to modify existing designs and to have an effect mainly on the productivity of the firm (Freeman & Perez 1988; Henderson & Clark 1990). These could be termed simply new to the firm innovations in contrast to new to market innovations, which are often described as radical or disruptive (Robertson 1967; Johannessen et al. 2001; Danneels & Kleinschmidt 2001). Radical innovations change technologies and industries; that is, they disrupt the established patterns and create new markets (Schumpeter 1963; Freeman & Perez 1988; Henderson & Clark 1990). To make this distinction between the novelties of innovation is important since it affects development and commercialisation processes. For instance, a radical innovation has an inherently longer development process due to its technological uniqueness and more demanding commercialisation process because of uncertainty (Verzyer 1998).

In addition to innovation novelty, a distinction in the sources of innovation can be made. In the context of technological change, Dosi (1982) discussed the distinction between "*demand pull*" and "*technology push*" as origins of inventive activity, pointing out the importance of both in initiating the innovation process (see also Mowery & Rosenberg 1982). Demand pull refers to a situation in which an idea originates from a customer or user need, and the marketplace is seen as a source of ideas for R&D (Mowery & Rosenberg 1982; Rothwell 1994, cf. von Hippel 1988). In a technology push model, science is perceived as a source of innovation and inventions are made without a specified market need in focus (Mowery & Rosenberg 1982; Rothwell 1994). Neither one of these drivers exists in the pure form, but science, technology and the structure of market demand play an interactive role in the innovation process (Mowery & Rosenberg 1982). Since their effects on the innovation process differ, for instance in launching inventions on the market, innovation characteristics and drivers are worth considering in studies of innovation processes.

In this study, the analysis is limited to radical technological inventions and commercialised innovations in the life science sector. Here, radical is defined as *new to both the company and market*. Considering the diverse underlying characteristics of innovation (e.g. type, source and novelty of innovation), it is

argued that these are likely to affect the adopted development, collaboration, commercialisation and internationalisation strategies in companies. Given the new market-creating characteristics of radical innovations, opportunities for growth are sought in many high-technology developing businesses from foreign environments because of limited domestic opportunities. Life science companies often face this difficulty because they might find only a few domestic customers, especially if they originate from a small country. The need to internationalise is incorporated into all of a company's strategies and processes from the start.

2.2.2 From invention to innovation

Innovations are initiated by different drivers and aims, but some similarities can nevertheless be described in the development process of transforming technological inventions to commercialised innovations in entrepreneurial companies. The innovation process view has evolved from early linear models (Trott 2005; Balconi et al. 2010 for critical discussion of the linear model) to more complex models which acknowledge that innovation is often a continuous process with overlapping activities (Kline & Rosenberg 1986; Rothwell 1994; Dymond et al. 2012). Linear models proceed from one activity to another, whereas in more **integrated innovation process models** different activities are pictured to be overlapping, to progress partly simultaneously (Rothwell 1994) and to have multiple sources of knowledge and multiple routes to innovation (e.g. Kline & Rosenberg 1986; Berkhout et al. 2010). These models (e.g. Kline & Rosenberg 1986) emphasise the integration of different activities and knowledge required to develop an innovation instead of illustrating only the innovation management stages (Cooper 1988; Veryzer 1998). In the fairly established innovation process literature, there are generally two perspectives to address the innovation process: technological development and innovation management (see Appendix 3 for examples of different innovation process models). This study adopts the former view, which follows both innovation system and innovation studies literature streams (e.g. Balconi et al. 2010).

Although simplifications of the innovation processes can be made, such processes are still extremely heterogeneous depending, for instance, on the industry in which the innovation process takes place, in-house experience and resources, or cooperation during the process (Pavitt 2006). Researchers have also presented evidence that, in a successful radical innovation process, the activities are overlapping and customer participation is higher, whereas failed

projects are characterised by sequential development activities (Coviello & Joseph 2012).

The present study defines the innovation process as "*the work of developing an invented element for practical and commercial use and of ensuring that the introduction of the element is accepted*" (Sundbo 1998, 19-20). This definition of the innovation process emphasises the commercial use of inventions, as suggested by the innovation definition used in the study, and therefore includes the sales and distribution activities of innovation. However, for analytical convenience, the innovation process is often divided into three activities: research (idea generation), development and commercialisation, each composed of different actions and aims (Rothwell 1994). This technology-driven perspective is applied in the present study in order to provide a simple and clear illustration of the main activities of the innovation process in an entrepreneurial company (Figure 3). Like entrepreneurial internationalisation, the innovation process has a cyclical nature.

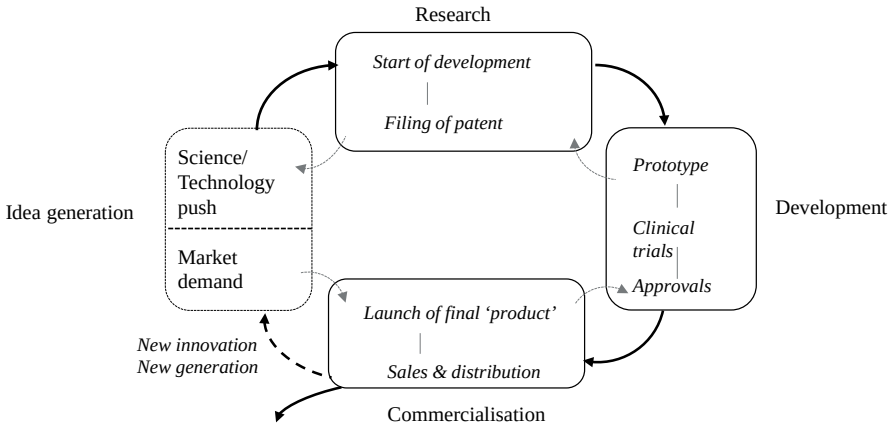

Figure 3 The innovation process

As discussed in Section 2.2.1, innovations originate from science or the market, from the recognition of a problem or a need, or from the interplay of the two (Rogers 1983). At this point, an idea is just a concept, a thought or a collection of thoughts (Trott 2005). The idea generation acts as a stimulus to research and the start of innovation development. *Research activity* in the innovation process is generally understood to entail basic and applied research that aim to generate new knowledge to judge options and/or solve practical problems (Dodgson 2000; Rogers 1983). Basic and applied research are often interrelated, especially in innovations originating from practice (Balconi et al. 2010). With science-driven innovations, patents are filed at this stage.

Research and development activities are commonly difficult to separate as they are highly overlapping in many innovation processes (Rogers 1983). Yet, *development* contains activities that aim to demonstrate technical viability and translate demonstrated principles into new products, services or processes; in other words, development results in the transformation of the idea of invention into a form that is expected to satisfy user needs (Rogers 1983; Dodgson 2000). These actions result in a testable prototype of an invention. In the linear model, production is introduced as an individual step (Balconi et al. 2010), but here it is combined with the development activity in which a prototype is produced. In some highly regulated sectors, such as life science, this development activity includes testing of the pilot product, for example, the running of clinical trials and meeting the requirements for approvals (Nosella et al. 2006; Jones et al. 2011b; Dymond et al. 2012).

The next step is to *commercialise* the invention. This is deemed to be one of the most critical activities of the innovation process in entrepreneurial companies (Chiesa & Frattini 2011), especially with novel technology inventions in which both the need and the market are non-existent and must be created (Colarelli O'Connor & Rice 2013). Many new technology start-ups face a challenging phase called the 'Valley of Death' at the edge of innovation commercialisation before the company starts generating revenues; during this phase, new financial resources are difficult to obtain, and entrepreneurial motivation is challenged (Wessner 2005). This challenge relates essentially to publically funded, science-based technologies in which the commercial transformation from invention to innovation might be prolonged.

In the linear innovation process model (Rogers 1983; Balconi et al. 2010), commercialisation, diffusion and adoption are separate activities, but here commercialisation is understood as all activities required to bring the invention to market, including overseas markets. Commercialisation is acknowledged to be composed of different marketing and sales actions and even phases (see Chiesa & Frattini 2011); however, these activities are not explicitly addressed in this study. According to Stremersch and Van Dyck (2009), the commercialisation of life science products is demanding because of the complexity of the health care customer base. For new science-based ventures, understanding the requirement to market their products might take some time. In particular, Melén and Rovira Nordman (2007) argued that it is beneficial for the success of the internationalisation if entrepreneurs themselves are engaged in experiential learning, for instance in commercialisation. Yet, these entrepreneurs are often highly science-oriented and have not yet accumulated marketing knowledge (Brännback et al. 2007).

Innovation development is complex and composed of different activities, and companies encounter various uncertainty-driven challenges that may

require external knowledge as a complement or a substitute for often scarce internal capabilities to overcome, especially in small entrepreneurial companies (Teece 1986; Rothwell & Dodgson 1991; van de Vrande et al. 2009). One central factor in the successful progress of the innovation process is cooperation in order to overcome for instance market and technology uncertainties companies encounter, as addressed in this study. McDermott and O'Connor (2002) showed that especially in radical innovation projects cooperative alliances are critical to manage uncertainty and achieve success. In general, R&D collaboration is intended to broaden a company's internal activities and resources, as well as to maintain or to enhance its competitive, often technological, strength (Hagedoorn et al. 2000). Innovation demands such complementary knowledge as it is usually not economically feasible to develop all such required know-how in-house (Teece 1986); however, collaboration in innovation also requires the ability to integrate and combine various types of knowledge inputs (Cohen & Levinthal 1990). Besides, inter-organisational relationships allow resource-sharing that in turn contributes to the building of competitive advantage (Dyer & Singh 1998). For a starting entrepreneurial company, seeking external resources might be the only feasible strategy to gain growth. In some industries, like in life science, innovation processes require vast but different partner networks in different activities (Renko et al. 2008).

Technology-based innovation is understood here as the main resource of an entrepreneurial company, the engine for its existence. The engagement in different kinds of inter-organisational relationships to obtain lacking resources from the beginning of the innovation origin may result in a company's unique bundle of relationships becoming one of its critical intangible resources on which advantages in internationalisation can be formed. Resource orchestration is hence one central activity in entrepreneurial innovation (Autio et al. 2014), but also in entrepreneurial internationalisation.

2.3 Resources in internationalisation

The innovation process or the entrepreneurial internationalisation process does not take place without process inputs, which in this study are conceptualised through resources. International entrepreneurship is inherently about acting on opportunities whether discovered or created in the international context, but much of this actualisation is dependent on the interpretation and construction of opportunities (Alvarez & Busenitz 2001; Mainela et al. 2013). What this entails is that opportunities are not similar to all entrepreneurs, but neither are the resources or capabilities needed to match these opportunities (Kuemmerle

2005). Resources are often not internally available, but can be supplemented through external, often cross-border, links (Jones 2001; Di Gregorio et al. 2008). Companies' resources on which they build their competitive advantage to operate in the foreign context are unique, inimitable and valuable (Oviatt & McDougall 1994; Bloodgood et al. 1996; Knight & Cavusgil 2004). Due to the increasing interest in small, internationally operating companies, which are described as suffering from tangible resource scarcity, such as finance or manpower (Shelton 2005; Autio et al. 2011; Hewerdine et al. 2014), the view that focuses on explaining the development and leveraging of resources and capabilities has gained popularity in internationalisation studies (e.g. Rialp et al. 2005; Di Gregorio et al. 2008; Melén Hånell et al. 2013). In the literature, this approach has been termed the resource-based view (RBV) (Barney 1991). A company's resources are perceived to consist of two main types of assets; tangible, such as technology and capital, and intangible, for example knowledge, skills, reputation, and networks (see Grant 1991 for detailed typologies of different kinds of resources). In this study, following Amit and Schoemaker (1993), resources are referred to as tangible and intangible stocks of factors that are owned or controlled by the company.

The main premise of **the RBV in international entrepreneurship** is that the stocks of tangible and intangible resources companies possess provide advantages in foreign markets, for instance by allowing a direct start at international markets or rapid internationalisation (Oviatt & McDougall 1994; Jones & Coviello 2005). At the same time, resource accumulation can largely determine and even constrain small firm internationalisation (Ahokangas 1998). For instance, in the life science industry, internationalisation from a company's inception might be challenged because of the lack of the right kind of market and marketing knowledge or experience (e.g. Brännback et al. 2007). Although life science products have global demand, some companies exhibit passive adaptation to the global environment.

Often smaller ventures construct their competitive advantage on intangible resources such as social capital (e.g. Yli-Renko et al. 2002; Partanen et al. 2008), network relations (e.g. Coviello & Munro 1997; Mort & Weerawardena 2006; Prashantham 2006; Tolstoy & Agndal 2010; Lindstrand et al. 2011) or human capital (e.g. Melén & Rovira Nordman 2007; Rovira Nordman & Melén 2008). Yet, technology resources may also provide a company leverage in the international market, especially if the company is holding a radical technology (e.g. Oesterle 1997; Zahra et al. 2003; Schweizer 2014). Technology, or innovation, is based on various intangible resources since development requires several intangible assets, like access to science networks, knowledge and experienced personnel, to mention a few examples.

2.3.1 Resource-seeking and allocation in entrepreneurial internationalisation

Small companies adapt to the ad-hoc internationalisation process rather than follow any pre-determined sequential process or deliberate internationalisation strategy from their establishment (e.g. Oviatt & McDougall 1994; Jones 1999; Jones & Coviello 2005; Di Gregorio et al. 2008; see Rialp et al. 2005 for a review). Companies can entrepreneurially build up resources and capabilities for a couple of years 'at home' and extend these activities to the international market (Fletcher 2004), or they can integrate their resources in international economic activities through the entrepreneurial process (Mathews & Zander 2007; see also Dimitratos et al. 2010 for the concept of a 'global smaller firm'). The view put forward by Mathews and Zander (2007) suggested that the internationalisation path reflects an entrepreneurial observation of new domestic versus foreign opportunities and strategic choices of internal versus external resource configuration and deployment, as well as the adaptation of resources to (domestic/international) competition. In this resource-centric view, international competitive advantage is attained via external knowledge and resource networks and inter-firm relationships (Mathews & Zander 2007; see also Di Gregorio et al. 2008; Hewerdine et al. 2014). If internal resources to internationalise are not found, external resources will be exploited. This behaviour is called **resource-seeking internationalisation** in contrast to market-seeking behaviour. Inter-organisational relationships (and networks) can serve as a mean to access resources, but they can also become an inimitable and valuable intangible resource for a firm (Gulati et al. 2000).

From the resource-based studies in IE, those approaches that touch either on the compilation of resources in the network and partnership contexts (e.g. Jones 1999; 2001; Mathews & Zander 2007) or the deployment of resources (e.g. Ahokangas 1998; Di Gregorio et al. 2008; Autio et al. 2011; Hewerdine et al. 2014) prove to be the most fruitful for the resource-seeking framework proposed to entrepreneurial internationalisation. This study claims that an even bigger need for resources is observed in technological innovation-developing companies whose access to scientific resources is extremely important. Moreover, these resources are unlikely to be found within domestic boundaries.

At large, companies can pursue four resource accumulation strategies in the international context; acquisitions and mergers which result in sharing control of resources, partnerships to jointly develop resources, the formation of relationships with expert organisations and internal development (Ahokangas 1998; Shelton 2005; Ruzzier et al. 2006). The *resource adjustment model* by Ahokangas (1998), depicted in Figure 4, suggests that small business interna-

tionalisation depends on the ability to develop resources within the company or between companies in a networked manner. This model includes the above four modes of developing resources for internationalisation. The chosen model is largely based on the control of resources, which also highlights that the internationalisation development strategy may vary between cross-border activities and functions over time (Ruzzier et al. 2006). For instance, different functions in the innovation process may require a different operationalisation mode for resource adjustment. Sustainable internationalisation is achieved through the successful adjustment of resources (Ahokangas 1998). The interest in this study is in how companies seek external resources through the modes highlighted in grey in Figure 4.

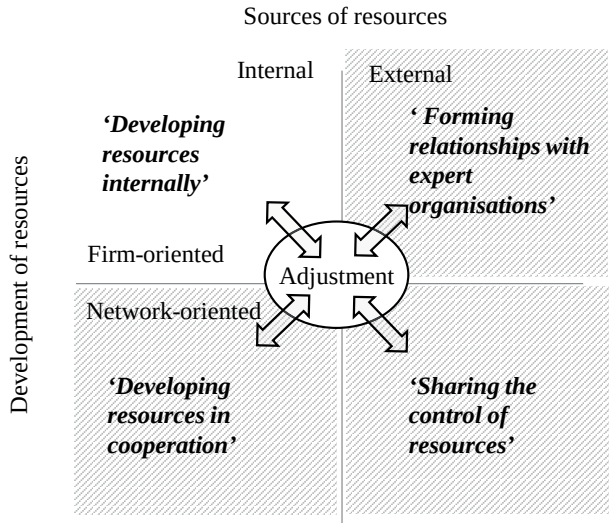

Figure 4 The resource adjustment model (Ahokangas 1998, 79)

Internal development (e.g. time invested in experiential learning) and resource-sharing (e.g. money invested in joint ventures) require long-term investment and financial assets, whereas the cooperation and relationship strategy allows trading and exchanging of resources that provides companies various opportunities for resource-seeking (Shelton 2005). Trading and exchange can take place without cost and therefore might offer a quicker way for entrepreneurial companies to access external resources. In the entrepreneurial company context, the creative combination of accessible (internal and external) resources is suggested to be a feasible approach in tangible resource-restricted situations. In the literature, this 'resources at hand' approach has been called *bricolage* (Baker et al. 2003; Baker & Nelson 2005). According to

Baker and Nelson (2005), bricolage in organisational studies is composed of three behaviours: reliance on resources that are available cheaply or for free; combination and reuse of resources; and testing of received limitations.[5] Furthermore, the bricolage approach to resource deployment in the internationalisation of an innovative and entrepreneurial company is beneficial to the formation of competencies and capabilities, as suggested by Autio et al. (2011) who emphasised resource fungibility in international entry.

A recent alternative approach to resource-seeking behaviour in internationalisation, called *resource scavenging*, was proposed by Hewerdine et al. (2014, 246). They described this approach in the following way: "*they* [companies] *needed to purposefully seek appropriate resources and apply all possible means to access them. With little to offer in exchange, these firms' only option is to make the best use of what their larger partners make available to them. This strong dependence on resources provided by partners, lack of alternatives and the necessity to utilise everything that becomes available led us to draw an analogy with scavenging behaviours observed in the natural world.*" Both bricolage and scavenging approaches emphasise improvisation and creativity in resource-seeking, a behaviour that is typical in an entrepreneurial company in international entry as well as during the innovation development stage (e.g. Hewerdine et al. 2014; Senyard et al. 2014). Important links in resources can start accumulating in the early stages of company life.

To understand resource-seeking in entrepreneurial internationalisation, it is imperative to consider, first, factors associated to how resources are sourced (e.g. the forming of inter-organisational relationships) and, second, what kind of role resources create in the entrepreneurial internationalisation process (e.g. inward–outward links).

2.3.2 Inter-organisational relationships in the innovation process

Entrepreneurship scholars have noted that the innovation process is a central activity in an entrepreneurial company and that often innovation is a company's main resource in seeking growth (e.g. Drucker 1985; Acs et al. 2001; Autio et al. 2014). It is also known that small companies rely on cooperative relations with external partners to succeed in innovation development (e.g. Tether 2002; Fukugawa 2006; de Jong & Freel 2010), and that the innovation networks have been shown to be important for innovation-related economic

[5] For an informed entrepreneurship literature reader, bricolage resembles closely Sarasvathy's concept of effectuation (e.g. Sarasvathy 2001).

growth (Freeman 1994) and for successful commercialisation (Partanen et al. 2011; see Pittaway et al. 2004 for a review on networking and innovation). Previous studies have also offered evidence of the importance of partnerships in successful internationalisation (e.g. Coviello & Munro 1997; Tolstoy & Angdal 2010). Yet, less is known about how relationships are formed and utilised during innovation development in entrepreneurial companies (Renko et al. 2008), and how these relationships relate to the internationalisation of the company. Koza and Lewin (1998) suggested that research should address the utilisation of innovation-related relationships through the co-evolvement of alliances with explorative and exploitation objectives in a firm's strategy. This approach suits well to the proposed innovation-based examination since the innovation process activities are likely to have differing needs and motives.

At large, there are two ways of treating inter-organisational relationships, either as a source of knowledge or an intangible resource (Dyer & Singh 1998; Gulati et al. 2000). Though these views are not mutually exclusive, this study opts for the latter view and understands inter-organisational relationships as an intangible organisational resource that can facilitate resource exchange and transfer in the entrepreneurial internationalisation process. According to Ritter and Gemünden (2003, 745), "*inter-organisational relationships are seen as long-term oriented arrangements between organisations (firms, institutions, agencies, etc.) which are 'maintained for some overall functional purpose'*[6]". In this line of reasoning, inter-organisational relationships are seen as a source of competitive advantage (see e.g. Wernerfelt 1984; Barney 1991; 2001) in resource-seeking internationalisation but also a basis for organisational routines and skills (see e.g. Nelson & Winter 1982; Helfat & Peteraf 2003).

In entrepreneurial companies, external resources are often needed throughout the innovation process, all the way from the pre-venture time to the different internationalisation states (Melén & Rovira Nordman 2007; Renko et al. 2008). The first and most demanding task is to create innovation collaboration relationships, especially in science-based sectors, such as life science. In these sectors, links to basic research are crucial. The literature has identified three main motivation factors to engage in collaborative relationships for innovation (Hagedoorn 1993; Powell et al. 1996; Dyer & Singh 1998). The first group of factors (i.e. asset, resource and risk-sharing motives) have their roots in the transaction cost economics, which emphasise risk versus return calculations when selecting suitable collaboration partners (e.g. Pisano 1990; Mowery et al. 1996; Powell et al. 1996; Koza & Lewin 1998). Uncertainty is

[6] Original source: Håkansson Håkan – Turnbull, Peter W. (1982) Inter-company relationships: an analytical framework. Working Paper of the Centre for International Business Studies, Uppsala University 1982/8.

the major pushing factor in forming cooperation alliances (Mowery et al. 1996), but benefits of cooperation are realised as concrete innovation projects which lead to shortened innovation processes. The second group of motivation factors is centralised to learning that stresses capability development (e.g. Powell et al. 1996; Eisenhardt & Schoonhoven 1996). According to Hagedoorn (1993), the monitoring of emerging technologies and general developments in science are among the main reasons for forming technology alliances and cooperating in innovation. To stay in the forefront of technologies and have access to the sometimes-restricted diffusion of scientific and technological knowledge are important for innovative companies, and this knowledge would not be accessible without the exchange relationships (Veugelers 1997). Last, the third set of motives relates to commercialisation, for example creating new markets and products, and gaining market entry (von Hippel 1988; Eisenhardt & Schoonhoven 1996; Mowery et al. 1996; Hagedoorn et al. 2000). This third class incorporates many inter-organisational relationships related to internationalisation, such as finding distributors or export partners. Sometimes inter-firm alliances and cooperation are formed also for legitimacy and image reasons (e.g. Shan et al. 1994; Eisenhardt & Schoonhoven 1996), which might relate to access to external resources, like financial assets. For instance, uncertainty faced in pioneer companies might require such companies to form these kinds of relationships.

Each activity of the innovation process has its specific function of commercial transformation of invention to innovation (see Section 2.2) that suggests different needs and motivations to form collaborative relationships may arise (Koza & Lewin 1998; Rothaermel & Deeds 2004; Nummela & Nurminen 2011). Research activity in the innovation process contains high uncertainty, risk and experimentation due to the need to learn and build up new capabilities in the organisation (March 1991). For this reason, opportunity-seeking activities are likely to benefit from long-term partnerships with research institutions like universities or research organisations, or R&D joint ventures and alliances, in which new knowledge is co-created and novel discoveries made (Levinthal & March 1993; Rothaermel & Deeds 2004). Intense and longer-term relationships with external partners are better for knowledge and know-how transfer (Cavusgil et al. 2003; Howells et al. 2003), especially for tacit knowledge transfer, in which learning-by-doing has a crucial role (Howells 1996; Dyer & Singh 1998). Although the length of a relationship plays an important role in collaboration, it is often neglected in the research (Howells et al. 2003). Links to science are not the only beneficial relationship; in fact, the benefits of a relationship depend on the innovation type and origin, since studies from the service sector indicate links to customers in explorative

activities are highly important (Love et al. 2011). Technological radical innovations tend to have strong relations to research field.

In turn, the development activities of innovation concentrate on finding application areas for inventions, and are characteristic of applied science which aims to solve practical problems (Rogers 1983). Here, regular contacts with customers can yield to absorbing insights of user-needs and ideas. Especially in life science innovation, links to marketing and distribution partners are important to create market pull for the innovation (Renko et al. 2008; Stremersch & Walter Van Dyck 2009). Furthermore, collaboration needs in development activities relate to contract R&D (Love et al. 2011), or legal and regulatory competences (Rothaermel & Deeds 2004) to implement steps in prototyping or regulative requirements. For instance, strategic partnerships to outsource clinical trials are formed in many areas of life science, like in pharmaceuticals, in the development phase (Howells et al. 2008).

Any investment in R&D collaboration will not materialise unless innovations are taken into use or into market. Exploitation is associated with improving and refining the existing capabilities to maximise returns to assets (March 1991). Exploitation requires the union of complementary assets such as knowledge of marketing and sales, distribution and production (i.e. know-how that often relies on experienced firms). Therefore, commercialisation activities benefit from collaborative arrangements in which knowledge is shared efficiently. Such arrangements include social networks and the use of informants to build credibility and establish a market position, for example. Any company engaged in innovation should balance exploitation and exploration. As Levinthal and March (1993) noted, commercialisation and exploitation activities may easily overtake exploration as the former yields to clearer and earlier feedback. The importance of commercialisation in innovation shows in the rich network and collaboration-related literature it has attracted (e.g. Partanen et al. 2011; Aarikka-Stenroos & Sandberg 2012; Aarikka-Stenroos et al. 2014) which has highlighted the benefits of the network relationships. Especially the commercialisation of radical invention demands specific tasks, such as the building of credibility or the unlearning of user habits that are often managed with the help of network partners (Partanen et al. 2008; Aarikka-Stenroos & Sandberg 2012). Research has shown that in life science commercialisation poses challenges for companies because of the complexity of the market; that is, life science innovation users (e.g. patients) might differ from its customers and key decision-makers, for instance hospitals and physicians (Stremersch & Van Dyck 2009).

Innovation relationships appear in many forms and can be classified various ways (e.g. Powell et al. 1996; Hagedoorn 2002). Figure 5 illustrates an example of possible inter-organisational relationships in an innovative com-

pany. The building of the relationships can depend not only on the geographical proximity of partners, but also on the similarity of knowledge bases (cognitive proximity) and control and autonomy in the relationship; that is organisational proximity (Boschma 2005). For an innovative company, higher proximity in many aspects in relationships might be beneficial for the sake of novelty, as will be discussed in Section 2.3.3.

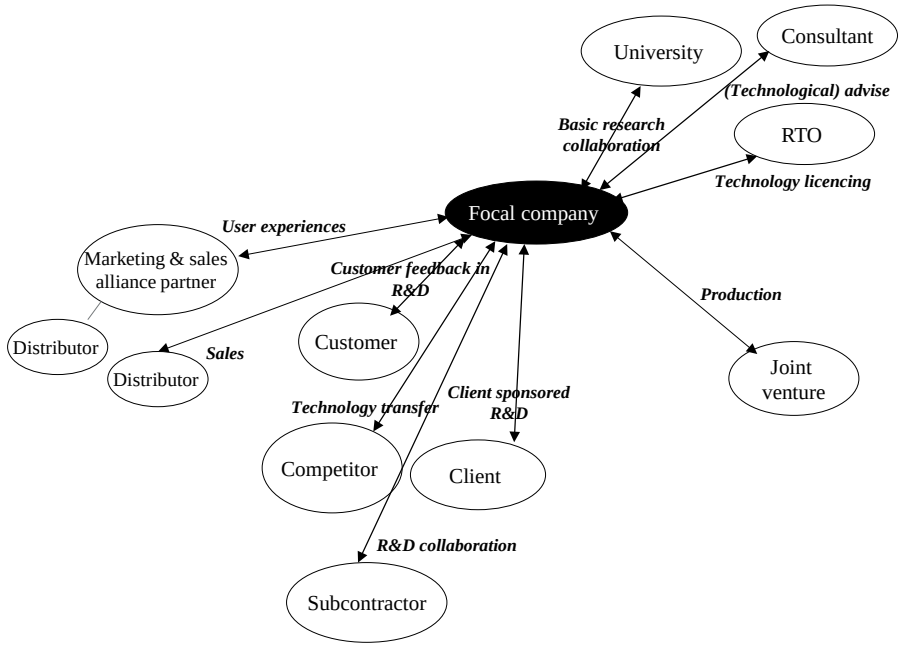

Figure 5 Illustration of potential inter-organisational relationships in an innovative company

Yet, the often used taxonomy comprehends formal and informal agreements of which the former includes equity-based R&D partnerships, such as strategic alliances (e.g. Eisenhardt & Schoonhoven 1996; Koza & Lewin 1998; Bierly & Coombs 2004), while the latter contains arrangements with no contractual or legal status (Håkansson 1990; Powell et al. 1996; Hagedoorn et al. 2000). Furthermore, informal collaboration practices are often tied to a company's networks, i.e. social and relational capital (Inkpen & Tsang 2005; Partanen et al. 2008). Ronstadt and Kramer (1983), for instance, discussed scanning activities, which include attendance at scientific/technical conferences, hosting of in-house seminars with leading international speakers or creating a company's technical advisory panel of outside experts (see also Renko et al. 2008 for the life science field). In this study, both formal and informal innovation collaboration arrangements are acknowledged as far as they have a specific

role, whether intentional or non-intentional, in the progress of the innovation process. Informal collaboration is included because serendipity plays often an important role in entrepreneurial companies, and several studies, especially on social capital and networks, have pointed out that the informal relations in entrepreneurial companies might trigger events in firm internationalisation (see, e.g. Prashantham 2006; Mort & Weerawardena 2006; Partanen et al. 2008). Accordingly, this study attempts to take a broad perspective of collaboration in the innovation process, and combine both informal and formal collaboration activities into the inter-organisational relationship.

2.3.3 Cross-border innovation search

As argued, the locus of innovation is transferring to external networks (Powell et al. 1996; Pittaway et al. 2004). Organisations either explore new possibilities and internal and external relationships of technologies, or wish to exploit existing organisational capabilities, resources and knowledge, for example through innovation or technology transfer (March 1991; Gustafsson & Autio 2011). Given that this study explores the role of inter-organisational relationships in entrepreneurial internationalisation, the geographical proximity of collaboration partners is of particular interest (Boschma 2005; Davenport 2005). This dimension can be seen as an innovation search dimension of the innovation process.

It is argued that multitude of partners in innovation knowledge sourcing is beneficial because depending too strongly on local innovation knowledge may lead to a detrimental lock-in in technology and knowledge, which will affect the company's ability to source novel knowledge in-house and innovate accordingly (Narula 2002; Boschma 2005). Boschma (2005, 62) defined lock-in in innovation as a "*lack of openness and flexibility*" in learning and knowledge. The challenge of lock-in may be solved by increasing access to and utilisation of cross-border knowledge sources (Boschma 2005; Kotabe et al. 2007). According to Boschma (2005), geographical proximity might be an advantage to successful cooperation, but he further argued that any of the proximities[7] is not a sufficient condition in itself but it is rather the combination of the different proximities that improves innovation. Using Boschma's (2005) framework of proximities, Letaifa and Rabeau (2013) showed how social proximity is the only attribute that facilitates collaboration. This is a highly valid notion for a small company in which networks are often entrepreneur-related (e.g. Eisenhardt & Schoonhoven 1996; Partanen et al. 2008).

[7] Cognitive, organisational, social, institutional and geographical proximity (Boschma 2005).

Given that small businesses might face challenges in extending innovation collaboration strategies to the overseas environment, it has been demonstrated that a firm's higher absorptive capacity improves the likelihood to collaborate with overseas partners (Drejer & Vinding 2007, see also Bougrain & Houdeville 2002). A study by de Jong and Freel (2010) supported this argument, and they showed that a majority of the collaboration partners of high-technology companies are still local, not overseas (see also Freel 2003; Gertler & Levitte 2005). Yet, innovators are shown to have wider geographic reach in external collaboration linkages compared to non-innovators in manufacturing (Freel 2000; 2003) and in biotechnology (Gertler & Levitte 2005). In fact, the proximity of innovation partners matters in an innovation search. It has been argued that a shared common regional culture and proximity facilitate face-to-face communication and learning, especially in the transfer of tacit knowledge (Gertler et al. 2000; Boschma 2005).

The findings regarding geographical proximity between collaboration partners in innovative small businesses are still ambiguous, largely because the location dimension has not been vastly applied in studies of open innovation or innovation collaboration (see Appendix 1 for a review of selected studies). Although cross-border collaboration has been seen as important to avoid lock-ins in innovation, it has received surprisingly little interest in the small business literature, researchers have paid even less attention to entrepreneurship with a concentration on collaboration in innovation and venture development processes (cf. Eisenhardt & Schoonhoven 1996). Yet, some evidence of innovation cross-border links in the internationalisation of companies has been found (e.g. Jones 1999; 2001; Korhonen 1999; Lindqvist et al. 2000), and some studies have even addressed the innovation perspective. An example of the latter is a study by Lindqvist et al. (2000) that looked at local and global links in the innovation process and concluded that the importance of local and cross-border influences varies in different activities of innovation. In contrast, Korhonen (1999) and Jones (1999; 2001) related the cross-border aspect to the early inward internalisation of small businesses.

Given that this research is interested in growth taking place in the international context, the location of inter-organisational partners is of natural interest. Therefore, this study considers the geographical proximity of collaboration partners between domestic and cross-border, and regards *cross-border inter-organisational relationships to be those in which a counterpart is located in a country other than the innovation developer*. Figure 6 illustrates the inter-organisational relationships that are in the focus of this study.

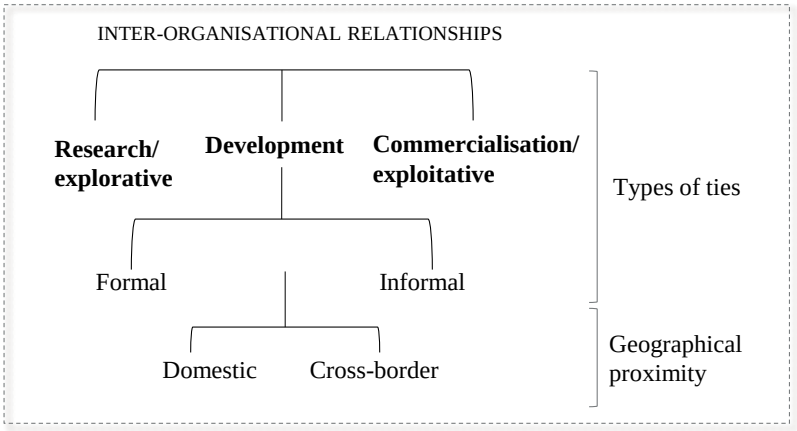

Figure 6 The inter-organisational relationships in the study

It is proposed that there are three types of inter-organisational relationship ties that relate to innovation process activities: research, development and commercialisation, and these ties can be either formal or informal agreements. Furthermore, inter-organisational relationships either take place across country borders or are formed with domestic partners. The geographical dimension of an inter-organisational relationship is seen to be highly influential in resource-seeking as, for instance, cross-border relations might create important inward–outward links in the internationalisation process.

2.3.4 Inward–outward links in resource-seeking

The resource deployment in internationalisation can be operationalised through the links to external resources in different value chain activities created via inter-organisational relationships in which companies engage. One interesting approach to achieve this resource deployment is offered by an **inward–outward internationalisation** investigation that builds its main argument on the importance of incoming resources in internationalisation instead of placing emphasis only on the exploitation of resources (Welch & Luostarinen 1993; Korhonen et al. 1996; Jones 1999; Holmlund et al. 2007; Freeman et al. 2013). More importantly, this approach highlights the impact of translating inward to outward links in internationalisation (e.g. Welch & Luostarinen 1993; Korhonen et al. 1996). It is argued that including an inward dimension in internationalisation assists to examine resource-originating explanations for entrepreneurial internationalisation (Jones 2001). Resources and capabilities for internationalisation might be assembled in the flux of inward and outward activities in many entrepreneurial ventures, as this study

proposes. In the study context of entrepreneurial internationalisation, the *inward links* are understood to be those inter-organisational relationships that bring resources into internal processes, whereas *outward links* relate to exploiting internal resources. Therefore, it is likely that inward activities relate more to research and/or the development of an innovation and outward activities relate to commercialisation and later phases of a venture's life (e.g. production, sales, and marketing). Yet, in practice, both activities occur throughout the internationalisation process (Welch & Luostarinen 1993).

Tying the innovation development to a company's internationalisation gives an opportunity to investigate inward–outward links in the entrepreneurial setting. As studies have suggested (Welch & Luostarinen 1993; Korhonen et al. 1996; Korhonen 1999; Lindqvist et al. 2000; Karlsen et al. 2003), the inward links with foreign actors are likely to happen in the early stages of a company's internationalisation. Furthermore, Korhonen et al. (1996) revealed that the majority of internationalisation activities that companies in their study initially engaged in were classified as inward rather than outward actions. Other studies (Welch & Luostarinen 1993; Fletcher 2001; Jones 2001) have proposed similar results. For example, a study by Lindqvist et al. (2000) showed that companies already have broad global inward links in the beginning of an innovation process, but they also showed that local and global links differ significantly in different activities of the innovation process. It can still be concluded that companies' contacts to cross-border sources are important in the early stages of innovation development, which makes it interesting to look at how these links are created in new starting ventures.

According to this holistic view on internationalisation that incorporates different in- and outflows of resources, companies might start their international operations for instance with imports of technology or by performing contract manufacturing or R&D for an overseas client, which are regarded as inward operations (Luostarinen 1994; Korhonen 1999; Jones 2001). The main aim of inward links is to source and transfer intangible and tangible resources inside the company, for instance to develop an innovation. In turn, outward activities have been seen in the literature as traditional internationalisation activities, like exports, licencing, foreign joint ventures or setting up a sales subsidiary (Welch & Luostarinen 1993; Korhonen 1999; Karlsen et al. 2003). In addition to the conventional outward links, Korhonen (1999) listed know-how and project export operations that could be interpreted to include some of the cross-border innovation-related inter-organisational relationships under scrutiny in this study. These non-investment outward activities are better suited to the international entrepreneurial venture context, than investment-intensive foreign operations.

Internationalisation is considered a two-way process consisting of inward and outward flows that proceed in tandem (Luostarinen 1994). However, the inward–outward approach is not only intended to explain the resource-based internationalisation; rather, in this holistic view, the inward and outward flows are tightly connected to each other. At best, the effectiveness of the inward activities could determine the success of the outward links in the internationalisation process (Welch & Luostarinen 1993; Korhonen et al. 1996; Karlsen et al. 2003). For this reason, the connection between inward and outward links is important (Holmlund et al. 2007). However, the evidence has not been consistent regarding the connection of inward and outward activities. Holmlund et al. (2007) reported that inward activities led to outward activities to a lesser extent than that earlier studies had suggested (e.g. Korhonen et al. 1996). In turn, Karlsen et al.'s (2003) study indicated that inward–outward connections lessen as a company grows. Inward–outward links might materialise, for instance, in university partnerships in a technology-oriented company, in which a foreign university provides scientific knowledge in terms of an inward link, but simultaneously becomes a potential customer of innovation. The results of the activities might be neither direct nor immediate (Welch & Luostarinen 1993). The combination of inward and outward activities might even be more common in entrepreneurial companies that operate with scarce resources and have informal management, than in larger companies. Improvisation is often valued in smaller companies' resource-sourcing strategies (Baker & Nelson 2005; Hewerdine et al. 2014). Yet, the learning from inward–outward connections is not always straightforward if these connections decrease over time, as suggested by Karlsen et al. (2003).

Internationalisation is commonly approached from the outward perspective, leaving the resource deployment unexplored (Mathews & Zander 2007; Hewerdine et al. 2014). Studies that have included inward–outward aspects still address a couple of issues important to this research. First, they have acknowledged that internationalisation might be triggered by actions and activities prior to the first international sales and that these activities are likely to start at the pre-internationalisation state in a venture's lifecycle (e.g. Jones 2001). Second, inward–outward studies have highlighted the dynamic process perspective that perceives internationalisation as interlinked activities (e.g. Welch & Luostarinen 1993; Korhonen 1999). This understanding supports the main premise of this research that internationalisation takes place in the interconnectedness of innovation development in a small entrepreneurial company. It is notable that, although it is suitable to study internationalisation in a small business context, studies that have applied an inward–outward approach in the international entrepreneurship context are fairly scarce. Only a few studies have been found in this matter; see, for instance, Freeman et al. (2013) for

strategic re-structuring in born global firms and Jones's (1999; 2001) research of high-technology firms.

In comparison to traditional outward-oriented internationalisation, this study suggests that entrepreneurial internationalisation is dependent on inward links, therefore suggesting the resource-seeking approach in internationalisation. Entrepreneurial internationalisation is seen as a cyclical resource-seeking and -allocation process, in which resources are understood as both intangible and tangible assets needed for a company to grow in the international context (Figure 7). Internationalisation is a behavioural process in which international growth is achieved via observing international opportunities and matching these with resource commitments.

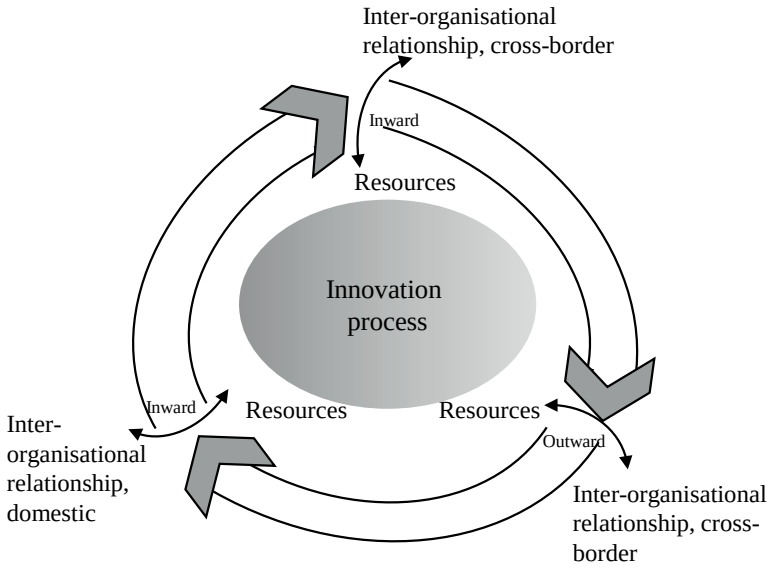

Figure 7 The inward–outward resource perspective in entrepreneurial internationalisation in innovative companies

Resources are transferred into the company via forming inter-organisational relationships in the entrepreneurial internationalisation process that, in turn, integrates activities from the beginning of the innovation process. Following Welch and Luostarinen (1993), inward and outward links, which are understood here as inter-organisational relationships, take place in a continuum in the entrepreneurial internationalisation process of an innovative company. Conventionally inward–outward links have been understood to take place only in an overseas context (Jones 1999; 2001). This study nevertheless expands the original thoughts to be better suited to the emerging venture con-

text which is likely to result in important inter-organisational relationships with both domestic and cross-border actors. Given the study's overall focus on the deployment of resources and the identifying capability to interact in the entrepreneurial internationalisation process, the domestic inter-organisational relationships are deemed strong contributors, for instance, to the formation of competences to collaborate; as such, it would be prejudicial to exclude those from the analysis. Accordingly, this study identifies three types of links in entrepreneurial internationalisation: (1) domestic inward; (2) cross-border inward; and (3) cross-border outward. Inter-organisational relationships can thus take different forms in different activities of the innovation process, as explained in Section 2.3.2.

Although this study recognises the importance of external resources in creating inward–outward links in entrepreneurial internationalisation, it is essential that companies develop the ability to identify, access and deploy external resources to gain international growth. Consequently, the entrepreneurial internationalisation process that is interrelated to the innovation process is claimed to consist of different states in this study.

2.4 The entrepreneurial internationalisation process

Although the process models have been criticised for their inability to explain the internationalisation of companies who operate in a highly international industry and internationalise rapidly (Turnbull 1987; Oviatt & McDougall 1994; Madsen & Servais 1997), it is yet beneficial to identify states of the entrepreneurial internationalisation process for the analysis, even if not strictly followed by the entrepreneurial companies. The process models have contributed to the international opportunity development (see Section 2.1) aspects of contemporary international entrepreneurship thinking. In addition, the notion that internationalisation is largely dependent on the range of contextual factors, both market and firm-specific (Fletcher 2001; Li et al. 2004), plays contingency a central role. This same perspective is also strong in entrepreneurial internationalisation where the entrepreneur's cognition[8] on and reaction to opportunities reflect the contingencies explained in internationalisation (e.g. Freeman & Cavusgil 2007).

Industry factors (e.g. innovation and business lifecycles, radicalness of technology, competition) influence the internationalisation processes, such as

[8] Mitchell et al. (2002, 97) defined entrepreneurial cognitions as "*the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth*."

speed and length (Andersson et al. 2014). The demand for life science technologies is global, but companies' mind-set might not be; in particular, the starting companies might lack competencies to grow internationally (Brännback et al. 2007; Lindstrand et al. 2011; Andersson et al. 2013). For instance, given that many of the life science companies are managed by scientists, the early phases of internationalisation might be prolonged from a strong technology focus that sets the marketing and commercialisation aspects aside (Brännback et al. 2007; Renko et al. 2008). Studies have also demonstrated that incremental slow internationalisation is favourable in life science companies to create sustainable business (Lindstrand et al. 2011; Melén Hånell et al. 2014). Previous studies have suggested that life science companies should engage in experiential learning in internationalisation rather than external knowledge acquisition to accelerate international growth (Melén & Rovira Nordman 2007; Lindstrand et al. 2011; Melén Hånell et al. 2014).

2.4.1 Pre-internationalisation

For the purpose of this study, internationalisation process models which offer an identifiable state of pre-internationalisation were reviewed. Pre-internationalisation is considered the most important state in the innovative entrepreneurial firm context as it suggests a period to develop important competencies for internationalisation. As has been argued, the inward links to innovation (Jones 2001) and other resource-seeking inter-organisational relationships (Hewerdine et al. 2014) are developed during this period.

Table 1 depicts states from the selected models from behavioural and IE internationalisation approaches that are best suited to examine the cyclical entrepreneurial internationalisation process, and covers states from pre-internationalisation to international commitment. The early export models (e.g. Olson & Wiedersheim-Paul 1975; Johanson & Vahlne 1977; Wiedersheim-Paul, Olson & Welch 1978) suggest internationalisation to start from the domestic setting, but for international new ventures such a phase is not feasible as companies operate in an international environment from the moment they are established (Oviatt & McDougall 1994, 2005). The framework of this study consequently suggests entrepreneurial internationalisation to start from the pre-internationalisation state, which integrates also the possibly purely domestic activities in which ventures engage.

Table 1 Selected internationalisation process models for the entrepreneurial internationalisation framework

State	Behavioural models	IE development and growth models	Entrepreneurial internationalisation process
0	Domestic stage or simultaneous with foreign operations [stage may be skipped]	Pre-start-up/venture creation; Entrepreneurial/ internationalisation event & action; Pre-start-up/venture creation; Introductory phase; INV creation; Conception & development and commercialisation	**Pre-internationalisation**
I	Knowledge, Commitment decision; Starting (Inward); Pre-internationalisation phase; Internationalisation readiness (Knowledge)		
II	Actual market commitment; Development (outward); Growth (outward); Commitment decision	Early international entry/development; International development decision & action; Pre-internationalisation; Growth and resource accumulation; Commercialisation and foreign entries; Rapid growth and foreign expansion; Growth	**Development**
III	Mature (cooperation); Actual market commitment	International growth/Consolidation; Commitment to international development; Post-internationalisation; Break-out and required strategies; Rationalisation and foreign maturity; Stability	**Commitment**
IV		Continuous change & development	
Sources	Johanson & Vahlne (1977; 2003); Luostarinen (1979; 1994); Tan et al. (2007)	Kazanjian (1988); Jones & Coviello (2005); Gabrielsson et al. (2008); Rialp-Criado et al. (2010); Gabrielsson & Gabrielsson (2013); Trudgen & Freeman (2014)	

Behavioural models have postulated that internationalisation starts from the initial international commitments and gaining of internationalisation readiness that can be understood as *pre-internationalisation*. Although these models have often skipped the purely domestic phase, domestic activities can yet take

place simultaneously with foreign operations as suggested by Luostarinen (1979; 1994). The pre-internationalisation state that has been bypassed in many internationalisation process studies and has, for instance, been identified as a weakness of the Uppsala model (Tan et al. 2007; Styles & Genua 2008) might constitute an important state in new ventures (Hewerdine & Welch 2013). As Table 1 reveals, the concept of pre-internationalisation is more present in the process models of IE and growth stream. The subsequent states in the proposed entrepreneurial internationalisation model are *international development* and *commitment*, which emphasise the intensification of international growth in the entrepreneurial company (see Section 2.4.2 for discussion). These states are identified in both behavioural and IE internationalisation process streams (Table 1). Generally, processes in behavioural and IE streams are depicted as sequential intensification without the internal development aspect that is a central factor in entrepreneur-focused process studies. In addition, such streams often exclude the continuous change aspect, which is, in turn, emphasised by Jones and Coviello (2005). Due to the company-level focus and the lack of longitudinal data, this last state is also neglected in the present study.

In order to link the innovation process to the entrepreneurial internationalisation process conceptually, the concept of pre-internationalisation is proposed (e.g. Tan et al. 2007). The investigation of activities performed prior to international sales and beyond the venture establishment are regarded as important especially in resource deployment and capability formation (Helfat & Lieberman 2002) but also in international new ventures at large (Coviello 2006; Mathews & Zander 2007; Styles & Genua 2008). The roots of pre-internationalisation thinking are in the pre-export behaviour suggested by Wiedersheim-Paul et al. (1978). The export models are not applicable as such to international entrepreneurial ventures, but since these models emphasise aspects such as the previous experience, past history and value system of the decision-maker (see Leonidou & Katsikeas 1996 for a review), they offer valuable insights in entrepreneurial internationalisation as well. For instance, studies have suggested that active firms in their pre-export activities face fewer challenges in starting their internationalisation compared to passively and domestically oriented firms (Wiedersheim-Paul et al. 1978). These examples of export behaviour emphasise connections described in inward–outward internationalisation, for instance.

Yet, few studies have focused on pre-internationalisation, and the literature is still too underdeveloped to offer a clear and consistent conceptual understanding of the term. Current studies have approached pre-internationalisation from the INV network (e.g. Coviello 2006; Styles & Genua 2008; Vasilchenko & Morrish 2011) or the internationalisation process (e.g. Jones 2001; Tan et

al. 2007; Liesch & Knight 1999; Kamakura et al. 2012; Da Rocha et al. 2012) perspective. Some studies have specifically addressed issues such as the development of internationalisation readiness (Tan et al. 2007), organisational learning and capabilities (Anderson et al. 2001; Prashantham 2008) and strategic issues (Bell et al. 2004), which are all important factors in pre-internationalisation behaviour. Nonetheless, very few of these studies have focused on analysing pre-internationalisation activities as such.

While some definitions and interpretations of pre-internationalisation exist, this study follows the proposal given Tan et al. (2007) which perceives pre-internationalisation as the state preceding commitments to the foreign market. They also suggested that pre-internationalisation is a state that all companies experience. Although Tan et al.'s (2007) definition is missing the clear boundaries of pre-internationalisation, it is broad enough to include the inward and outward resource links (inter-organisational relationships) that are seen as the main pre-internationalisation events in this study. It furthermore includes the previous experience and roots of the entrepreneur and innovation that are emphasised in the birth of capabilities (Helfat & Lieberman 2002; Helfat & Peteraf 2003). Helfat and Lieberman (2002) argued that different types of entrants are likely to hold distinct sets of resources and competencies prior to market entry. For instance, de novo entrants might not possess extensive tangible resources, like scientific partnerships, that a university or company spin-off might have. Moreover, spin-offs might possess extensive knowledge of the regulations and marketing needed in a sector, for instance in highly regulated life science, compared to new entrants (Chatterji 2009). Similarly, the human capital (knowledge, skills, experience) of entrepreneurs differs and drives to differing behaviours in internationalisation (Manolova et al. 2002; Rovira Nordman & Melén 2008; Zhao et al. 2013). Likewise, a manager's previous experience from operating in foreign markets and establishing foreign contacts and networks can enhance internationalisation (Oviatt & McDougall 1994; Coviello & Munro 1997; Prashantham 2006). Moreover, resource and capability formation are largely path-dependent and follow learning trajectories (Nelson & Winter 1982; Helfat & Lieberman 2002).

In order to include the above aspects of entrepreneurship into pre-internationalisation, the following working definition is proposed in the study: *pre-internationalisation is a state preceding engagement in entrepreneurial internationalisation*. Here, engagement is understood as the first outward cross-border link (inter-organisational relationship) a company employs, and describes a first outward action rather than a cognitive strategic decision to commit to grow internationally, as understood by Tan et al. (2007), for instance. This outward cross-border action often in practice refers to the first international sale event. As this definition implies, pre-internationalisation in

innovative and entrepreneurial companies links closely to basic research and pre-commercial development activities of the innovation process. Linking entrepreneurial internationalisation to the innovation process means that the commencement of pre-internationalisation is understood to connect to the start of innovation development. Not only does pre-internationalisation include exploring opportunities for innovation, but it also contains the set-up of the venture, which requires companies to locate external resources (Trudgen & Freeman 2014). It can also be claimed that companies are at least to form relationships with external experts during pre-internationalisation, if not yet to collaborate fully with cross-border partners (Ahokangas 1998). These relationships can later impact outward links in the entrepreneurial internationalisation process.

Pre-internationalisation is an important point in the entrepreneurial internationalisation framework as it first integrates technological innovation with internationalisation (Jones 2001; Prashantham 2008) and second affects the formation of capabilities (Helfat & Lieberman 2002; Sapienza et al. 2006; Mathews & Zander 2007; Tan et al. 2007; Autio et al. 2011). Pre-internationalisation is likely to vary from company to company depending on the length of the innovation process and the nature of the pre-internationalisation activities undertaken. Innovation processes are hence highly dependent on the sector; for instance, in life science, innovation processes often take many years to complete and require exploitation of various knowledge sources from science to uses of innovation (Renko et al. 2008).

2.4.2 Development and commitment to entrepreneurial internationalisation

After passing the pre-internationalisation state, commitments to international growth intensify to the subsequent states, known as international development and international commitment in the entrepreneurial internationalisation model. Tangible and intangible resource commitments are expected to change according to the needs in innovation, while routines operating in inter-organisational relationships are expected to strengthen as the entrepreneurial internationalisation process progresses.

During international development, the company gets gradually more involved in outward inter-organisational relationships, as suggested in the stages model (Luostarinen 1979; 1994). Since this state relates to innovation development in which innovation is moving closer to market launch, it is likely that the company begins to make decisions regarding, for instance, manufacturing and initial marketing and sales. Yet, given that international

development starts after the first outward cross-border relationship has been established, more and more cross-border inward and outwards links are potentially observable than in the previous pre-internationalisation state. Companies must still seek additional resources, especially financial resources, before committing to compete in the international context (Gabrielsson et al. 2008). Given that companies at this point have just made the initial outward movements to exit the pre-internationalisation state, new skills necessary to operate in the international market are likely to emerge at the development state of entrepreneurial internationalisation as well. Furthermore, many inter-organisational relationships were initiated during pre-internationalisation, and these relationships are likely to intensify, offering opportunities for learning and capability formation (Gabrielsson et al. 2008).

The international development state in new ventures often contains the venture development activities (Trudgen & Freeman 2014) since technology development in innovative ventures may require the bulk of the time in pre-internationalisation, thereby postponing the incorporation of the venture. Companies seek various resources, like people and finance, to establish themselves in the marketplace (Trudgen & Freeman 2014). Therefore, in innovative entrepreneurial companies, venture creation might take place at the same time as pre-internationalisation or even later (cf. Rialp-Criado et al. 2010). In the present study, the international development state follows a pre-internationalisation, and is defined as *a state of increasing commitment to entrepreneurial internationalisation.* This state is characterised by resource accumulation and growing engagement in cross-border inward and outward inter-organisational relationships to gain access to resources. Resources are also increasingly developed together with external partners, moving beyond simply forming relationships (Ahokangas 1998). At this state, the company begins making investments in internationalisation, for instance by implementing an internationalisation strategy, and appropriately builds a foreign sales network.

The next state, international commitment, interlinks mainly with commercialisation of the invention, and strengthens the commitment to international operations in an entrepreneurial company. In this state, the initial innovation is on the market already, and next-generation innovations are in the pipeline. Luostarinen (1979; 1994) suggested this state to include more cooperative operation, which could be interpreted to include, for instance, the foreign distribution network that companies must build to sell their products. Given that companies' internationalisation intensifies, it is likely that the international commitment state becomes more strategic, even in small international ventures, in which the different states of entrepreneurial internationalisation might be difficult to observe. According to Rialp-Criado et al. (2010), the

early stages of entrepreneurial internationalisation might be less analytical and more flexible in terms of strategy compared to states when companies are to make longer-term decisions on international growth.

In the international commitment state, ventures are already tapped into the overseas resource networks, and routines in exploiting and operating in inter-organisational relationships have advanced as well. The company is able to fully function in the international resource-seeking context, and better position itself in the global resource networks (Gabrielsson et al. 2008). Furthermore, as resource and knowledge levels have increased, the company is able to use more investment-intensive forms to source additional resources. Dividing the strict boundaries between the different states of entrepreneurial internationalisation is challenging, but operationalising the switch from entrepreneurial internationalisation development to commitment is even more challenging. Therefore, it is proposed that commitment in the entrepreneurial internationalisation process is a state in which the company *operates fully in the international context*. By *fully*, it is meant that the company is well-established in international resource networks and deploys extensively these cross-border resources, but it is also well-established in global niche markets to seek growth. A clear change in attitude is also observable in the company mind-set as it intensifies investments in and commitment to internationalisation, and purposefully builds and nurtures cross-border inter-organisational relationships (Freeman & Cavusgil 2007). Given that, in framework, the commitment state characterises the most advanced state in the entrepreneurial internationalisation process, it would be reasonable to expect to find an indication of shared resource accumulation as suggested in the resource adjustment model by Ahokangas (1998).

The proposed entrepreneurial internationalisation states (*pre-internationalisation, international development* and *international commitment*) are illustrated in Figure 8. These states suggest to link the innovation process but might not run synchronised with innovation process activities since some take longer than others. For instance, innovation development activities might run longer due to the clinical trials needed in life science that prolong the pre-internationalisation state. Pre-internationalisation often captures activities of the innovation process prior to commercialisation. It can also be that moving from one state to another may not be the result of a single event but a process of intertwined events (Hewerdine & Welch 2013). Moving from one internationalisation state to another might require solving growth-related problems encountered in each state, as suggested by Johanson and Vahlne (2009), who emphasised that the commitment to internationalisation grows as learning and trust-building in the network relationships intensify (see also Johanson & Vahlne 1977). International growth-seeking companies are likely to face

uncertainties and critical events in their internationalisation process that push the company forward, given that it has access to sufficient resources and capabilities to overcome these ‘crises’. Commitment and understanding of internationalisation evolve gradually during the entrepreneurial states of new ventures, as suggested by Freeman and Cavusgil (2007), pushing companies to develop a greater collaborative mind-set. Furthermore, the suggested cyclical form of entrepreneurial internationalisation results from the nature of innovation which is a continuous activity in an entrepreneurial, or in any, company. Innovation and entrepreneurial internationalisation processes are interconnected and follow each other.

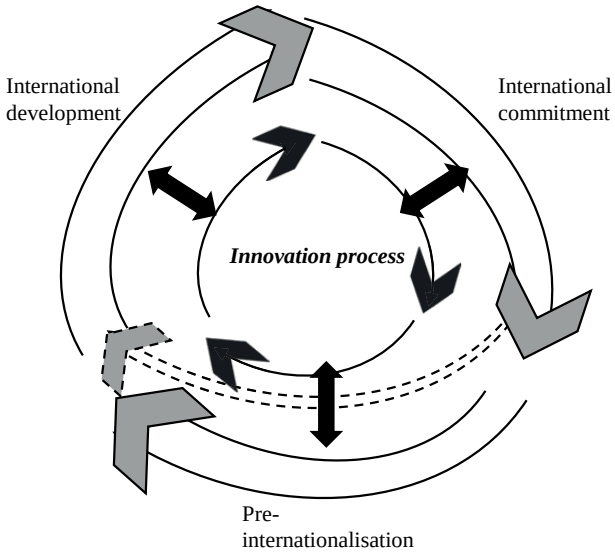

Figure 8 Entrepreneurial internationalisation states

Consequently, this study suggests that an entrepreneurial company follows these behavioural states in an entrepreneurial internationalisation path but the boundaries of the states are likely to vary between companies. Furthermore, a starting new venture follows the proposed three states in the cyclical entrepreneurial internationalisation process, whereas an experienced company might bypass the pre-internationalisation state (indicated as a dashed line in Figure 8) if it stays with the same technology field in subsequent innovation processes. If innovation development, however, deviates from the existing technology and knowledge base and the company has to build completely new inter-organisational relationships and markets, it might go through a new pre-internationalisation phase. Yet, radical changes in technological assets are not

expected to occur in starting ventures. The main focus is to observe these entrepreneurial internationalisation states through the lenses of the deployment of external resources (i.e. inter-organisational relationships) and collaboration capability, although it is acknowledged that many other important factors, such as funding and entrepreneurial learning and cognition, are also related to entrepreneurial internationalisation. The proposed conceptualisation addresses an important gap, since especially pre-internationalisation behaviour remains a largely unexplored area in international entrepreneurship and process studies at large are lacking as well in entrepreneurial internationalisation research (Tan et al. 2007; Styles & Genua 2008; Prashantham 2008; Hewerdine & Welch 2013).

2.5 Capabilities in resource-seeking internationalisation

Researchers already know much about the importance of external links in internationalisation (e.g. Coviello & Munro 1997; Jones 1999; 2001; Mort & Weerawardena 2006; Prashantham 2006), but how companies identify, access and integrate external links, like inter-organisational relationships, in entrepreneurial internationalisation is less known. Given that entrepreneurial internationalisation is perceived mostly as a growth and development process (Jones 1999), multiple competences and abilities to master this process are required. One such competence is the capability to collaborate or network with external partners to acquire resources (Torkkeli et al. 2015). In a new venture, the development of capabilities can, yet, be sticky because of intangible and tangible resource restrictions, but time is not on entrepreneurs' side since competences to internationalise are often needed quickly. In fact, the pool of capabilities may determine the growth path the company follows (Chen et al. 2009); for those new ventures that aim for fast growth, quick competence accumulation is important. For this reason, it is essential to look at how resources are employed and capabilities form in new starting ventures (e.g. Sapienza et al. 2006; Torkkeli et al. 2015), rather than assuming that a company holds a set of resources and capabilities required to progress in entrepreneurial internationalisation. Organisational resources play a critical role in the formation of capabilities since resource commitments are the precondition to execute organisational capabilities (Amit & Schoemaker 1993). The mere possession of unique resources is not yet sufficient to build sustainable international competitive advantage; rather, companies must have the ability to consciously and systemically perform deliberate strategic choices and actions over time (Lado et al. 1992; Montealegre 2002; Mishina et al. 2004). The underlying premise of the capability view in IE is that enhanced and unique

competences lead to improved results in internationalisation. For instance, the ability to form networks (i.e. to develop network capability) aids to overcome resource constraints often associated with a new venture's international entry and expansion (Mort & Weerdawardena 2006; Torkkeli et al. 2015).

Given that a partnership-type of operation is vital to entrepreneurial ventures to access required resources, knowledge and skills to draw competitive advantage (e.g. Coviello & Munro 1997; Chetty & Campbell-Hunt 2003; Mort & Weerawardena 2006; Prashantham 2006), it is crucial to understand how competences to access and integrate partners in organisational processes emerge. The integration is even more demanding when those inter-organisational partners are located overseas. In many new ventures, these overseas relationships create the first inward and outward links to the international market, as shown in Jones (2001) and Welch and Luostarinen (1993). To understand the antecedents of capabilities, micro-process-focused studies (e.g. Di Gregorio et al. 2008; Autio et al. 2011; Torkkeli et al. 2015) are informative as they provide knowledge of the origin of organisational routines on which competencies and capabilities can form, and address the entrepreneur's strategic perceptions, for example on internationalisation. However, literature has pointed to understanding the antecedents and influence of capabilities in internationally operating firms as an important but under-researched area (Mathews & Zander 2007; Weerawardena et al. 2007; Jones et al. 2011a; Autio et al. 2011). Networking activity as a capability deserves further attention as well (Mort & Weerawardena 2006), although some recent advancement has been made in investigating the emergence of network capability in the SME internationalisation process context (Torkkeli et al. 2015).

In this study, it is argued that the capability to collaborate which builds from the external resource deployment (i.e. inter-organisational relationships) facilitates the entrepreneurial internationalisation process as companies learn to better utilise their external resources to overcome uncertainties related to international growth. For instance, they learn to translate inward to outward links in internationalisation. The capability perspective might raise the question of how inward links are connected to the outward internationalisation, like previous studies on the subject have claimed (e.g. Welch & Luostarinen 1993; Korhonen et al. 1996). These studies have not explained this connection mechanism in detail. In addition, variations in the capability to collaborate are expected in different states of the entrepreneurial internationalisation process given that inter-organisational relationships are likely to vary as well. For instance, Rilla (2013) showed that, for invention commercialisation only, a comprehensive toolbox of different innovative and entrepreneurial capabilities is needed. However, in order to link the capability to collaborate to the context of the study (i.e. resource-seeking in the entrepre-

neurial internationalisation of an innovative entrepreneurial company), it is imperative to first examine the fairly complex definition of capability.

2.5.1 Capabilities in linking innovation and internationalisation

In this study, capability is understood, following Amit and Shoemaker (1993, 35), as a "*firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end*". The considerable history of research has given the capability concept a strong position in several streams of research, such as in strategic management (e.g. Amit & Schoemaker 1993; Teece et al. 1997; Eisenhardt & Martin 2000) and in international entrepreneurship (e.g. Zahra et al. 2006; Sapienza et al. 2006; Weerawardena et al. 2007; Autio et al. 2011; Al-Aali & Teece 2014). In addition, the concept of capability is often referenced in studies of innovation (e.g. Henderson & Clark 1990; Weerawardena & Mavondo 2011). However, regardless of the rich literature on capabilities – or, more likely, because of its vast exploitation – some have criticised that the construct is too abstract and vague and lacks understanding as well as empirical evidence of how the capabilities are developed, utilised and translated into value (e.g. Zahra et al. 2006; Wang & Ahmed 2007; Weerawardena & Mavondo 2011; Eggers & Kaplan 2013). A recent review by Eggers and Kaplan (2103) contributed to the latter field and addressed the behavioural side of the construct, by concentrating on how capabilities form. This cognitive view perceives capabilities to evolve over time on the basis of routines and on the managerial interpretation of their use (see Table 2 for the main conceptual differences in the traditional and cognition perspectives).

Table 2 The main conceptual differences in traditional and cognition-based understanding of capabilities. Compiled from Eggers and Kaplan (2013)

	Traditional view on capabilities	**Cognition view on capabilities**
Key question	How do capabilities lead to differential performance?	How are capabilities developed?
Focus	Organisation and environment	Micro-processes inside an organisation
Origin of capabilities	Experience and organisational learning, asset accumulation	Managerial choice of strategy
Construction	Capabilities are given from initial endowments	Routines (based on experience) constitute a building block of capabilities
Assembly	Managers hold full knowledge of the existing and potential capabilities	Managers need an interpretation of the purpose of capability
Deployment	Utilisation of capabilities is a (rational) strategic choice	Utilisation of capabilities is based on the interpretation of opportunities created
Theoretical basis	Resource-based view	Evolutionary theory, behavioural theories
Key references	Wernerfelt (1984); Barney (1991); Teece et al. (1997)	Nelson & Winter (1982); Henderson & Clark (1990); Amit & Schoemaker (1993); Winter (2000); Zahra et al. (2006); Eggers & Kaplan (2013)

The division in Table 2 does not suggest that the streams are mutually exclusive, but the capability concept is actually grounded in evolutionary economics (Nelson & Winter 1982) and the resource-based view of the firm (Barney 1991), both of which stem from Penrose's ideas of resources in firm growth (Penrose 2009). In fact, the division is a matter of selecting an angle and is useful in conceptualising the complex, and sometimes confusing, capabilities discussion.

In the cognitive line of reasoning, organisational routines and processes (e.g. Winter 2000) form the basis of capabilities. In spite of the negative connotation of routines, they are seen in a positive light in evolutionary discussion, and Nelson and Winter (1982, 97) referred to a routine as "*repetitive pattern of activity*" of either an organisation or individuals. Routines are built on previous experience (Coriat & Dosi 1998), whereas experiences accumu-

late, for instance, from innovation (Henderson & Clark 1990; Helfat & Lieberman 2002) or from previous employment of an entrepreneur or founding team (Shane & Khurana 2003; Agarwal & Shah 2014). Together, these form a pre-history of the capability (Helfat & Lieberman 2002; Helfat & Peteraf 2003) that creates an important source for the birth of capabilities, even more so in young and entrepreneur-managed companies where the organisational histories are traditionally short. In these companies, the competences are often entrepreneur-innovator bound (Boccardelli & Magnusson 2006). Consequently, learning and behavioural aspects are seen as important in the formation of capabilities. The same aspects are essential also in the behavioural internationalisation process models which build on learning and commitment cycles (e.g. Johanson & Vahlne 1977; 2009).

Although the cognitive approach emphasises routines and managerial cognition in capability, this study deviates from this strict approach due to its setting of new ventures. Therefore, in compliance with Autio et al. (2011), capabilities are regarded to form without managerial intent as especially new ventures that operate in an environment of high uncertainty might develop capabilities by accident. Given that small ventures have short histories, capabilities can be formed on top of nonrecurring processes, i.e. routines that are repeated seldom. Alternatively, capabilities can develop without strategic goals and means to achieve them, emphasising entrepreneurial and effectuation logic in capability formation (see Sarasvathy 2001).

As a final note on capabilities, this study operates in the sphere of substantial capabilities which, according to Winter (2003), refer to an organisation's ability to produce preferred outcomes which can be intangible or tangible in nature. Zahra et al. (2006) importantly pointed out the difference between dynamic and substantial capabilities, and argued that many studies have actually misinterpreted substantial capabilities as dynamic capabilities. Dynamic capabilities are seen as processes to reconfigure the substantial capabilities (Helfat & Peteraf 2003), which makes them higher-order capabilities that are highly strategic. Dynamic capabilities relate to the organisation's ability to change (Winter 2003; Zahra et al. 2006). As mentioned, this study concentrates on the capability to collaborate, which is, following Winter (2003), regarded as a substantial or operational capability (see also Helfat & Peteraf 2003). An ability to form and utilise inter-organisational relationships is seen as an essential intangible asset of an internationalising entrepreneurial company, and has therefore potential in acting as a supplemental connecting construct in the resource-seeking entrepreneurial internationalisation process that connects two processes (innovation and internationalisation).

2.5.2 Capability to collaborate

In order to make use of external resources across organisational boundaries, companies need to identify and allocate these resources (cf. innovation search). This activity is called resource interaction (Baraldi et al. 2012), and it requires the ability to source and transfer knowledge from different sources that cross organisational and country boundaries (Kotabe et al. 2007). The development of commercially successful products is largely dependent on a company's ability to organise and manage its innovation relationships (Geroski 1992), and to facilitate both local and global knowledge exchange and transfer (Bathelt et al. 2002). It is therefore interesting to identify what kinds of competences and abilities are needed to create and utilise these relationships, especially in entrepreneurial companies which have short organisational histories (Walter et al. 2006) and often scarce tangible and intangible resources (Dyer & Singh 1998). Innovative companies are involved in innovation and business networks and form different kinds of collaborative relationships to pass innovation development activities. As Håkansson (1990) pointed out, each inter-organisational collaboration relationship is an investment in a company and should be handled properly. Furthermore, the competitive advantage of a company can reside in relational capital stemming from inter-organisational relationships (Dyer & Singh 1998).

In order to manage wide relationships to access and gain resources, organisation-level competences are needed. In the literature, these competences are called network capability (Ritter & Gemünden 2003; Walter et al. 2006; Mitrega et al. 2012; McGrath & O'Toole 2013, 2014; Torkkeli et al. 2015) or collaboration capability (Blomqvist & Levy 2006; Chang 2011). Interestingly, although networks and collaboration have initiated rich literature (see Sections 2.3.2 and 2.3.3), the commitment, orchestration and management of network partners (i.e. capability concept) has been less explored in network and collaboration contexts (Blomqvist & Levy 2006; Aarikka-Stenroos et al. 2014). Since this study focuses on inter-organisational relationships from the focal company's point of view, the term collaboration capability is used instead of the more widely utilised network capability. The working definition for *collaboration capability*, based on Walter et al. (2006) and Autio et al. (2011), is a "*combination or sequence of processes to develop and utilise inter-organisational relationships to gain access to resources*".

The main conceptual difference between networking and collaboration capability is in the focus of action on which the capability is based (Figure 9). The capability to collaborate is understood in this study to emphasise the ability to interact in and take advantage of inter-organisational relationships,

whereas network capability refers to an ability to manage external relationships. These concepts are not exclusive but are conceptually different.

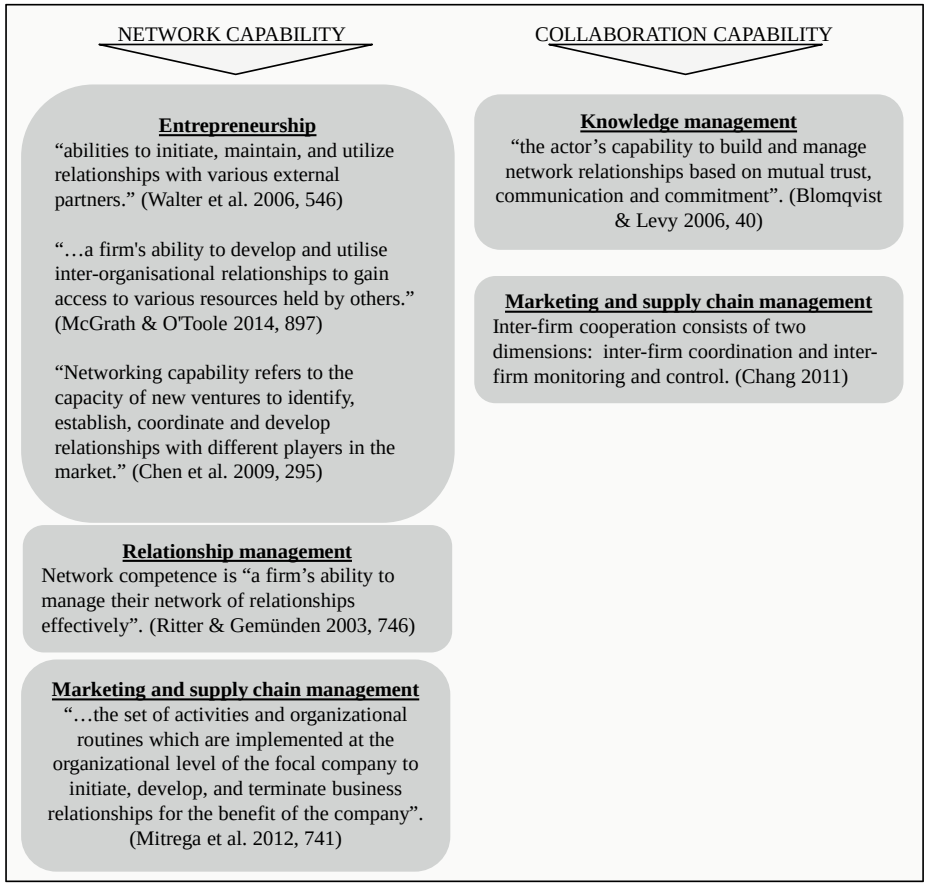

Figure 9 Network vs collaboration capability in selected literature

Following the adopted collaboration capability definition, the processes (routines) can be described to develop as a result of the regularly or seldom repeated inter-organisational relationship activities the company or the entrepreneur engages in when seeking resources for internationalisation. Routines are understood, for one, to translate into capabilities in the interaction of uncertainties encountered (e.g. in resource scarcity) and the adjustment of resources to address these challenges in order to progress on the intended entrepreneurial internationalisation path. Following the evolutionary view (Nelson & Winter 1982), routines are perceived as experience-based learning (cf. behavioural internationalisation process models).

Furthermore, the capability to collaborate is in this study seen as an additional company-level intangible resource, and it is expected to enhance access, development and deployment of external resources through inter-organisational relationships to facilitate entrepreneurial internationalisation. As Powell et al. (1996, 120) pointed out, "*both skill and experience are needed to accumulate the capability to benefit from the interdependencies across diverse collaborative behaviours*". Capability is important but does not merely refer to the ability to develop relationships, given that it is also important to learn from different relationships. Capability formation is first of all based on experience (Eggers & Kaplan 2013).

Although previous experience on collaborating and inherited networks is generally seen as a beneficial precondition for capabilities (Helfat & Lieberman 2002; Walter et al. 2006), it does not guarantee fluent capability development (McGrath & O'Toole 2013). Networking capabilities have been shown to form slowly as experience with working in collaborative relationships grows; however, at the same time, too much entrepreneurial control and lack of growth orientation may inhibit network capability development (McGrath & O'Toole 2013). A study by Torkkeli et al. (2015) proposed similar results, which showed that a lack of resources (especially financial) can seriously hinder the network capability development in a software born global company. Although the study by McGrath and O'Toole (2013) was not from a high-technology sector, it clearly illustrated that, given the positive and beneficial expectations of capabilities as an entrepreneurial growth motor, benefits do not always materialise. Capitalising on inter-organisational relationships and collaboration capability might prove difficult especially in entrepreneurial companies if the networks are very narrow (McGrath & O'Toole 2013).

Both skill and experience are needed to form the capability to benefit from the interdependencies across various collaborative relationships (Powell et al. 1996). A study by Walter et al. (2006) showed that university spin-offs perform better as their network capability intensifies, whereas entrepreneurial orientation had a less direct effect on performance. This finding indicates that, for an entrepreneurial company, the ability to connect internal resources to those in other organisations via building relationships is extremely important to gain growth. It is further argued that some of the relationships might be more influential in forming capability and forwarding the entrepreneurial internationalisation process than others. Moreover, inter-organisational relationships are formed and take place in different states of the process, some even prior to the beginning of internationalisation. This suggests that company-level capability to collaborate in entrepreneurial internationalisation begins to take shape early in the company's life, as it engages in inter-organi-

sational relationships that create inward or outward links in the entrepreneurial internationalisation process.

2.6 Framework for the interconnectedness of innovation and internationalisation processes

This section discusses and summarises the tentative framework of this study, which aims to explain entrepreneurial internationalisation in an entrepreneurial innovative company. The framework operates in the IE field and combines resource-seeking internationalisation and capability to collaborate in the interconnectedness of innovation and internationalisation processes.

The proposed framework of entrepreneurial internationalisation is built on the assumption that innovation and internationalisation processes are tightly interwoven via common resource deployment in an innovative entrepreneurial company. Since one of the central processes of entrepreneurship is innovation creation (Schumpeter 1963; Nelson & Winter 1982), it is claimed that, in the international entrepreneurial venture, innovation development is an integral part of the entrepreneurial internationalisation process. It is argued that technological innovation to a certain degree determines the entrepreneurial internationalisation process, depending on the characteristics and origin of innovation, for instance in the case of science-based radical innovation (e.g. Schumpeter 1963; Henderson & Clark 1990; Dosi 1982). Hence, the entrepreneurial internationalisation process is depicted to start from innovation development and to extend to the early days of the company's lifecycle. The innovation process concentrates on describing the innovation development (e.g. Kline & Rosenberg 1986), but ignores the creation and development of an international entrepreneurial company which in turn is a central theme of IE (e.g. Oviatt & McDougall 2005; Hewerdine & Welch 2013). In a new international venture, these activities take place simultaneously; therefore, these two processes should not be separated but combined in research interested in international entrepreneurship. **Behavioural internationalisation process models** (e.g. Johanson & Vahlne 1977; 2009; Jones & Coviello 2005) offer a conceptual lens to explain entrepreneurial internationalisation which is driven by a learning and commitment cycle, and is composed of interrelated entrepreneurial processes, as the model by Jones and Coviello (2005) advocated.

The other theoretical basis is offered in the **resource view on internationalisation** that bases its arguments on the resource-based view (Barney 1991). It is specifically suggested that a *resource-seeking internationalisation perspective* (Ahokangas 1998; Hewerdine et al. 2014) provides a suitable lens

to address entrepreneurial growth in this model. The focus is on how international entrepreneurial companies develop (e.g. Oviatt & McDougall 1994) which makes it important to understand at which state new ventures start creating links to cross-border resources, what are the conditions of these resources, and what role these have in the entrepreneurial internationalisation process. Entrepreneurial internationalisation studies have often neglected this aspect, although evidence of the inward–outward links exists (e.g. Korhonen 1999; Jones 1999; 2001). Furthermore, while the resource adjustment model proposed by Ahokangas (1998) takes into account the dynamics of the different resource types, it does not consider the cross-border dimension of resource-seeking. The cross-border element is inherent in international entrepreneurship, as well as in the innovation process to prevent situations of domestic technology and knowledge lock-in (Boschma 2005). In the proposed model, both these factors are included, with special attention placed on cross-border resource-seeking.

It is acknowledged that innovation is one of the fundamental resources that bring competitive advantage to an entrepreneurial company. Following the resource-seeking internationalisation logic, in the specific interest of the proposed framework, resources are gained via engaging in inter-organisational partnerships during the entrepreneurial internationalisation process. Through these domestic and cross-border relationships, a company builds important inward and outward links in the process. Following the arguments by Welch and Luostarinen (1993), it is argued that the inward links in the early periods of the entrepreneurial internationalisation process (i.e. innovation development) translate into outward links (e.g. sales contacts) in the later states. The state that often creates the early inward links and the first resource-seeking inter-organisational relationships is called pre-internationalisation (Tan et al. 2007). The engines of the entrepreneurial internationalisation process and capability formation, namely experience and learning, start to accumulate in this period. Learning is required for matching and deploying internal and external resources in uncertain situations during the entrepreneurial internationalisation process. This in turn shapes the capability to collaborate, which is needed to explore and exploit cross-border opportunities. The tentative framework is presented in Figure 10.

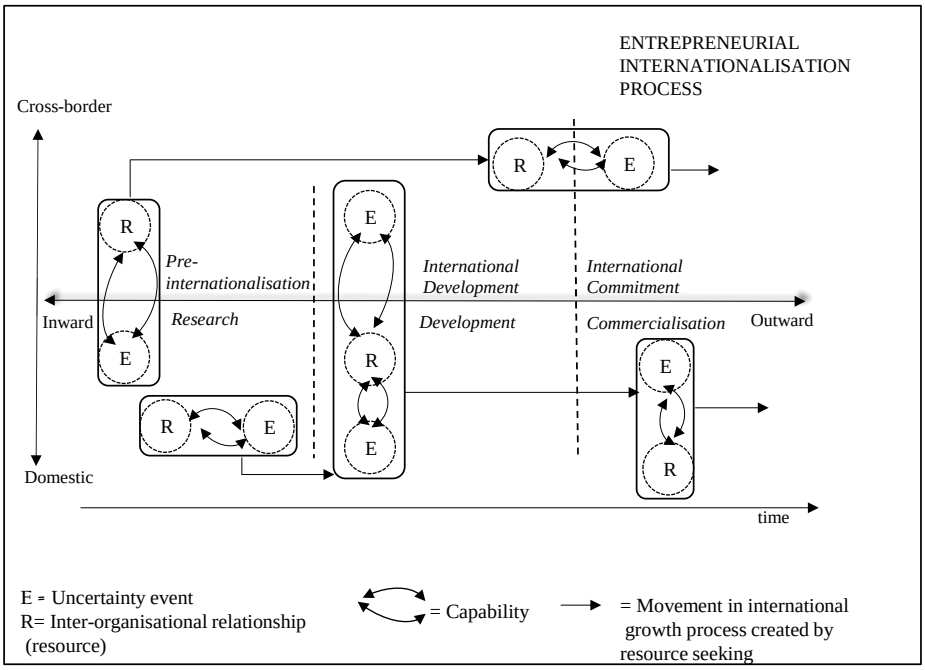

Figure 10 Tentative framework of the study

The entrepreneurial internationalisation process consists of three states: pre-internationalisation, international development and international commitment, which are in the model integrated into the innovation process. In the framework, uncertainty events (E) that drive the resource-seeking are uncertainties created in the flux of innovation and internationalisation processes. These are in a way seen as major challenges the company encounters in developing and commercialising an innovation and building the entrepreneurial company in an international context. Often these uncertainties are driven by the unavailability of required internal resources. In turn, this unavailability is tackled by either forming a new or using an existing collaborative inter-organisational relationship (R), that is the external resource.

Inter-organisational relationships take place not only in the continuum of domestic and cross-border proximity, but also in the continuum of inward and outward links. Inter-organisational relationships are formed with either national or foreign private or public organisations; alternatively, relationships can be formed by a group of organisations for performing the same task, for instance for manufacturing or basic scientific research. At the same time, these inter-organisational relationships also create an inward or outward link to the entrepreneurial internationalisation process. Inward and outward links happen throughout the entrepreneurial internationalisation process, but since inward links are understood to bring tangible and intangible resources in-house, these

are likely to materialise more in the beginning of the process (i.e. in pre-internationalisation). It is further suggested that some of the inward links translate into outward activities later in the entrepreneurial internationalisation process.

Although the states in the entrepreneurial internationalisation process (Figure 10) are pictured to run in parallel and to be synchronised, they can vary from company to company depending on the length of the innovation process and the nature of activities undertaken within each state. The lengths of different states are not therefore pre-determined. The proposed model extends pre-internationalisation from the initial steps in the company's history, to the start of innovation development, to a period that is claimed to contain the roots of important company capabilities as well (Helfat & Lieberman 2002). Tentatively, pre-internationalisation is considered to commence from the start of innovation development and last until the first outward activity takes place, which means that, in some companies, pre-internationalisation can include both innovation research and development activities. In addition to innovation development, it contains also the venture creation. It should, however, be noted that pre-internationalisation, like the other states, is depicted rather as a cognitive state in an entrepreneurial company than a pre-defined stage in the internationalisation process model. After pre-internationalisation, the company's entrepreneurial internationalisation matures through development and commitment that strengthen activities and operations to pursue growth in an international context.

Once the company has engaged in resource-seeking behaviour, the antecedents for the capability to collaborate start to form in the interplay of matching resources (i.e. the deployment of inter-organisational relationships) to uncertainty events. In Figure 10, the capability to collaborate is indicated as the back-and-forth arrows between uncertainty events (E) and inter-organisational relationships (R). Since collaboration capability is understood to formulate as a result of gaining routine and experience from operating in inter-organisational relationships, it is seen to give a positive pulse to the resource-seeking entrepreneurial internationalisation process. This follows the logic of the learning-commitment cycle in process models (Johanson & Vahlne 1977; 2009) and suggests these to be the antecedents for a capability to form. This progressive movement is illustrated in the forward-heading arrows in Figure 10 that also connect resources to each other because the capability to collaborate is seen as an organisational-level construct (e.g. Winter 2003; Walter et al. 2006). Different kinds of capabilities to collaborate possibly form through the interaction in inter-organisational relationships, but these differences may also be created by inward and outward links or resource types.

In the entrepreneurial internationalisation framework, seeking and deploying external resources are seen as the main forces to facilitate international growth (Ahokangas 1998; Hewerdine et al. 2014) because innovative growth-seeking companies operate in the international environment from their establishment and often even before incorporation. It is argued that the innovation process might have an even longer international history than the company. It is also suggested that, within this resource interaction, important competencies to collaborate begin to accumulate (Walter et al. 2006; Autio et al. 2011). These capabilities are seen as being positive for entrepreneurial internationalisation as companies holding collaboration competence are capable to efficiently explore and exploit cross-border opportunities, for both innovation development and venture creation, through their external resource relationships. What this also suggests is that, if companies avoid engaging in resource-seeking early on (i.e. start forming inter-organisational relationships), collaboration competencies cannot accrue and international competitiveness can be jeopardised, prolonged or even halted. The entrepreneurial internationalisation process intensifies as a company gains experience in resource-seeking and builds routines in operating in inter-organisational relationships.

To conclude, resource-seeking behaviour and the formulation of collaboration capability are seen as important factors in the interrelating of innovation process and internationalisation process in the entrepreneurial internationalisation. Competencies do not, however, accrue overnight; therefore, studying the learning and commitment cycles in innovative entrepreneurial companies is of importance in order to explain resource-seeking-based entrepreneurial internationalisation. The ability to take advantage of resource-seeking internationalisation to create an international entrepreneurial venture is important. The analysis of the entrepreneurial internationalisation process focuses on three main concepts: (1) resources as inter-organisational relationships; (2) inward–outward linkages; and (3) the capability to collaborate.

3 RESEARCH APPROACH AND METHODS

3.1 Research approach

The aim of this study is to understand the interrelatedness of innovation and internationalisation processes in an innovative entrepreneurial company. This aim is approached by identifying resource-seeking inter-organisational relationships and the capability to interact in resource relationships, in order to explain entrepreneurial internationalisation. These objectives direct the methodological choices taken in this study. The general guidelines for scientific practice steered by a paradigm which refers to a fundamental set of beliefs, assumptions and values (Kuhn 1996), are shared and accepted by the scientific community, and should be followed by any researcher wishing to contribute to the scientific discussion. A researcher might either deliberately ponder or un-deliberately follow these rules, but the choice of research methodology is yet guided by the researcher's ontological and epistemological assumptions which are shaped by paradigms. Furthermore, it has been encouraged in the literature (e.g. Grix 2004; Welch et al. 2011) to state one's philosophical research stance to allow others to better evaluate the underpinnings of the research, resulting in a clearer and more precise piece of work.

This study is set in between the positivist (explanation) and interpretivist (understanding) research paradigm, in the post-positivist camp (Grix 2004; Lincoln et al. 2011). From the ontological aspect (i.e. the nature of existence or being as such), the study falls closer to the objectivist than the subjectivist end of the continuum (Morgan & Smircich 1980). It adopts the critical realist research philosophical worldview, which steers the assumptions of knowledge and reality (e.g. Grix 2004; Easton 2010). Critical realist scholars attempt to combine understanding and explanation to allow interpretation and give room for competing explanations (Grix 2004; Easton 2010). The possibility for different explanations is accepted, or even encouraged (Welch et al. 2011). From an ontological perspective, critical realism assumes that the social world exists 'out there', without humans' awareness of its existence (Easton 2010; cf. Morgan & Smircich 1980). This also means that the social world cannot be fully understood; it is stratified and differentiated (Easton 2010).

The epistemological stance of critical realism claims that we are not able to know reality with certainty and the absolute truth of the real world does not exist (Lincoln et al. 2011). Nevertheless, critical realists accept the possibility

of knowing the reality (Easton 2010; Welch et al. 2011). According to Easton (2010, 119), "*we behave as if it was true, as if the world was real*". The critical realism approach acknowledges causal relations, but these are dependent on the careful examination of why things happened, which calls for identifying, understanding and explaining how causal mechanisms work (Easton 2010; Welch et al. 2011). The generative mechanisms that drive the interpretation of causal links are hence not directly observable, or not even always possible to observe (Easton 2010). Causes are not claimed to determine action in critical realism like the positivist scholars assume. Because of the profound understanding of the underlying mechanisms critical realism strives for, it is argued to be an appropriate philosophical stance for case research (Easton 2010), and it aims to generate contextualised explanations (Welch et al. 2011).

Following the logic of critical realism, there is no reason to believe that the main informants in this study (i.e. innovator-entrepreneurs) would not provide a truthful picture of the processes and their progress. The language acts as a bridge into reality, and it is used as a method to get information about the facts (Grix 2004). However, the studied processes exist 'out there', which separates process from subject (i.e. innovator-entrepreneur), even though a process is the result of human actions and knowledge is somewhat subjective.

3.2 The research design and process

The research design is a mixed methods design that consists of a quantitative pilot study and a qualitative multiple case study. The aim of the pilot study is to provide an overview on cross-border innovation collaboration; whereas the case study provides a deeper qualitative analysis of the entrepreneurial internationalisation process in an innovative entrepreneurial firm context. The reason for using a mixed methods design is twofold: to offer a more complete picture of the studied phenomenon and to expand the understanding gained from the first phase of study (Venkatesh et al. 2013). Mixed methods have further been stressed suitable design for studies following critical realism given its flexible view of reality and acceptance of different knowledge sources (Venkatesh et al. 2013). Given that this study combines both quantitative and qualitative approaches, but has a dominant qualitative approach, it can be termed as *qualitative mixed methods research* (Johnson et al. 2007). Here the qualitative case study creates the main study approach within the empirical research while the quantitative pilot study offers a supplementary perspective; because of this imbalance, the study is not seen as a 'pure' mixed methods study (Tashakkori & Teddlie 1998; Hurmerinta-Peltomäki & Nummela 2004; Johnson et al. 2007).

In addition to combining quantitative and qualitative methods, the study also follows a multiple-method approach, which emphasises the triangulation of data and sources (e.g. Jick 1979; Creswell et al. 2003). It has been argued in the literature that combining both quantitative and qualitative approaches gives more extensive and detailed information than using either of the methods alone (e.g. Venkatesh et al. 2013) and provides a more complete and holistic picture of the phenomenon under scrutiny (Hurmerinta-Peltomäki & Nummela 2004). Yet, the starting point and 'philosophical' home of the study is in qualitative research, which is well-suited to examine processes since it allows for rich description of situational details and for the opportunity to study phenomena in their natural environments (Gephart 2004). Furthermore, qualitative research addresses 'how' and 'why' questions to understand the informant's perceptions on the studied phenomenon (Gephart 2004; Pratt 2009).

In the present study, the empirical investigation was performed in two phases. Even though the main research design was a qualitative case study design, this study also employed quantitative survey data in the pilot study phase. The research started with the quantitative pilot study which provided background information and pre-understanding for the phenomenon and, secondly, served as grounds for selecting cases for the case research (Hurmerinta-Peltomäki & Nummela 2004). The pilot study utilised quantitative survey data on external innovation sourcing to gain information on the degree of cross-border collaboration in small businesses, and to help in selecting an industry context for the case study. After conducting the pilot study, the research moved on to qualitative analysis of the entrepreneurial internationalisation process. The applied research design is illustrated in Figure 11.

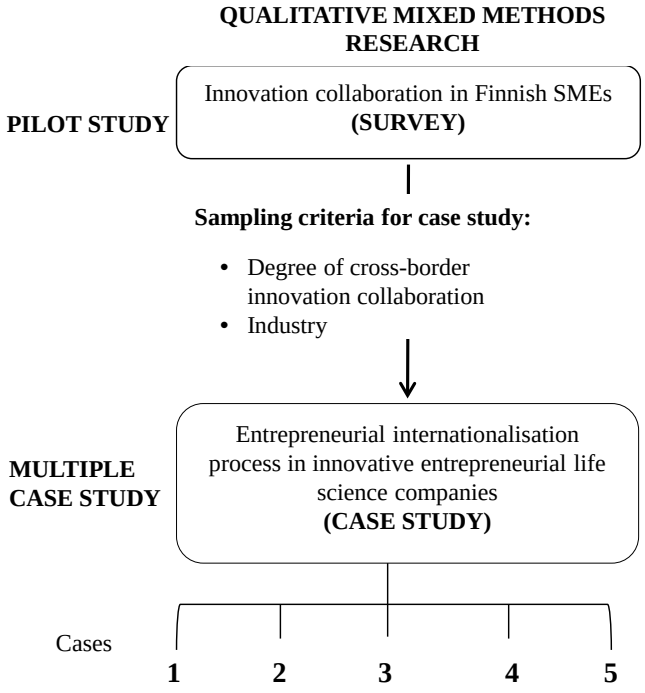

Figure 11 Research design of the study

On a basis of the pilot investigation, the theoretical framework and research focus were slightly modified to accommodate the case study research design, for instance the selection of cases (see Section 3.5.1). The original aim was to select two to six cases in order to secure enough material for comparison (Yin 1984), but in the end the study involved five cases altogether with the revised objective to seek commonalities between cases (Ragin 1994) rather than contrast.

The research process was directed by the author's previous research on innovative small businesses; therefore, background knowledge of the topic guided the researcher to make certain assumptions about the studied phenomenon of the interrelatedness of innovation and internationalisation processes. Consequently, the analysis process of this study cannot be said to follow purist inductive logic, which indicates that results should arrive from data without prior theoretical assumptions (Creswell 1998). Neither has the analysis been strictly deductive, which stresses a logic that has a strong theoretical orientation and data analysis on the basis of a previously constructed frame (Tuomi & Sarajärvi 2009). Between these two extremes, although closer to the inductive approach, lies a logic called systematic combining (Dubois & Gadde 2002; Tuomi 2008), or abduction logic (Klag & Langley 2013).

One of the main characteristics of abduction is that the analysis process is guided by data and theory in turns, which gives the researcher more freedom to really create new insights and encounter genuinely new observations and even surprises (Dubois & Gadde 2002; Klag & Langley 2013). This description suits the present study well in that the research process gradually evolved over the years, combining quantitative and qualitative approaches and theoretical reasoning in turns to understand the phenomenon (Figure 12). Constructing the theoretical framework to assess the relatedness of innovation and internationalisation processes was a multifaceted process in which theory and understanding from empirical research (in the research process of this study and other thematically related studies) ran in interplay. The interplay was lengthy, since the conceptual part of this research was partly steered by empirical work in peripheral research projects (illustrated in grey in the research process in Figure 12). The projects helped to focus this study and offered novel concepts (such as pre-internationalisation), but also guided the empirical work in the form of case selection. Some of the concepts, for instance open innovation, have even been rejected due to the lack of evidence of the concept found in peripheral research.

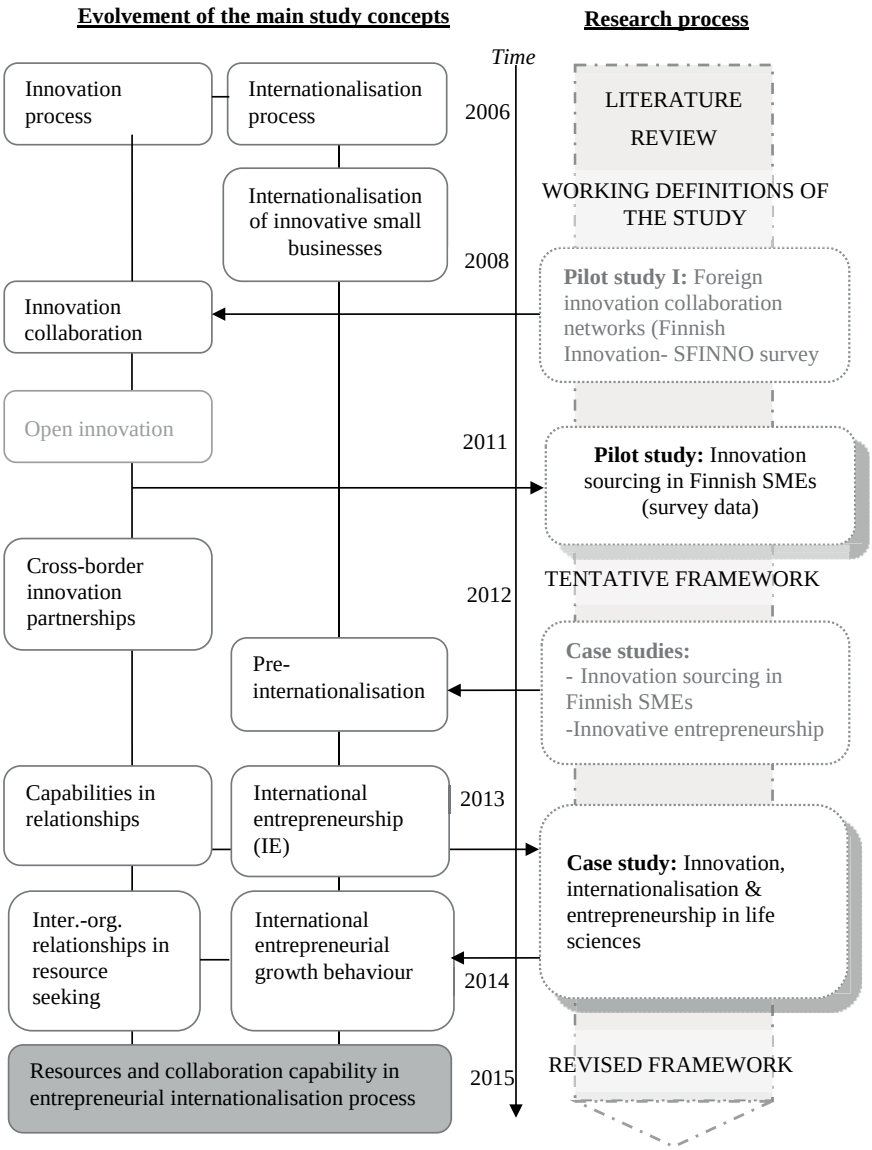

Figure 12 Evolvement of the study concepts and research

Instead of systematic abduction logic (Dubois & Gadde 2002), the study has rather followed the retroduction approach proposed by Ragin (1994), which stresses interplay of deductive and inductive research. Mixed methods research like this study that combines quantitative and qualitative traditions is likely to use different logics. Ragin (1994) argued that it is hardly possible to conduct research without the elements of both reasoning logics. This is also shown in Figure 12 in the depiction of how the research has unfolded and how

the key concepts of the study have emerged largely through complementary empirical studies.

3.3 Part I: The pilot study of innovation sourcing in the Finnish SMEs

The quantitative pilot study was performed for two main reasons. Firstly, it provided the author an opportunity to formulate a pre-understanding of the studied phenomenon, i.e. the use of cross-border collaboration in the innovation process. Furthermore, the general information on innovation sourcing in a small business context in Finland helped to focus the research questions and the case study. Secondly, the pilot study helped the researcher to select the industry context for the case study. The pilot study contained altogether five industries, of which the life science field was the most internationalised vis-à-vis innovation sourcing and collaboration; therefore, it was selected as the main study context.

3.3.1 Data collection for the pilot study

The data for the pilot study was collected in a research project[9] that examined international sourcing of knowledge in innovative Finnish SMEs. The knowledge sourcing refers to activities in which firms look elsewhere for ideas, expertise and knowledge for new product and process development as these firms cannot generate all the required expertise internally (Howells et al. 2003).

The survey was targeted to Finnish innovative SMEs from five different industries: biotechnology[10], mechanical engineering (Standard Industrial Classification [SIC] 28), consumer electronics (SIC 32), medical devices (SIC 33.1) and technical services (SIC 74.2-3). The population of Finnish innovation-active SMEs was combined from seven large datasets indicating firms' R&D, innovation and patenting activities. These datasets were: Statistics Finland R&D and Innovation Surveys 1991–2006; the Database of Finnish Innovations (SFINNO) maintained by VTT Technical Research Centre of Finland, Tekes (the Finnish Funding Agency for Innovation) client data, and the data on firms' patenting activities in the US Patent and Trademark Office (USPTO), in the European Patent Office (EPO) and in the National Board of

[9] A research project was performed at VTT Technical Research Centre of Finland in 2009–2012 in collaboration with MCI Management Center Innsbruck. The project was funded by Tekes and VTT.

[10] The biotechnology firm sample was compiled from member companies of the Finnish bioindustries association (Suomen Bioteollisuus ry - FIB).

Patents and Registration of Finland (NBPR) in 1985–2006. Based on the above sources, the total population of innovative companies operating in 2008 was 630. The web survey (n=630) was distributed in February–March 2010, and it generated a response rate of 22 percent (n=139).

The main aim of the survey was to acquire information on the internationalisation of Finnish SMEs' innovation activities. In addition to broader questions on the internationalisation of innovation (e.g. geographical reach of knowledge resources), the survey included more specific questions about innovation collaboration – how companies identify, access and absorb knowledge critical to innovation development. For example, a set of questions was related to the transfer practices of knowledge resources, making a distinction between direct and indirect channels.

3.3.2 Data analysis and the results

The data used in the pilot study consisted of 135 responses. Four responses of the original 139 were excluded from the analysis, due to duplicate responses. The pilot study of this research used only a few variables of the vast survey to illustrate the degree of cross-border innovation in Finnish SMEs, but results of the survey were fully reported in Lehtoranta et al. (2012). The data was originally analysed with the IBM SPSS Statistics programme in 2011, but some of the distributions were re-constructed in 2014 for this study. The main difference to the original study was that two fields, namely medical devices and biotechnology, were merged to form the life science sector; likewise, some responses from technical services were also re-classified as life science. This manual hand-picking was performed because an industry code for the life science sector does not exist since the field is actually a combination of different fields (see the discussion in Section 1.2).

As Table 3 indicates, the largest respondent group was firms in technical services (50%) and the smallest in consumer electronics (8%). The majority of the innovative companies operated in an international environment (61%) and were engaged in knowledge resources in an international context as slightly over half of respondents (59%) had at least one link to cross-border resources (see Table 3). The international companies were assessed through a survey question inquiring whether they had international operations in 2006–2008. This connotes that some of the companies might have operated on foreign markets previous to, or after, that period.

Table 3 Descriptive information of the sample

	No. of companies
Respondents, total	135
Technical services	68 (50%)
Life science (Medical devices; biotechnology)	17 (13%)
Consumer electronics	11 (8%)
Mechanical engineering	39 (29%)
Internationally operating firms	82 (61%)
Cross-border resources	79 (59%)

One way to gain information about the degree of innovation sourcing in Finnish small businesses is to look at the ways firms acquire knowledge resources. In the survey, the direct mechanisms for acquiring innovation resources were divided into three different groups according to duration and involvement. The short-term innovation sourcing mechanisms are largely purchasing practices, in which knowledge is simply acquired, not exchanged as in mid- and long-term collaborative relationships. What distinguishes long-term from mid-term is investment intensity related to the formation of joint ventures or the acquisition of an R&D unit which entails longer innovation cooperation.

In the sample, domestic innovation resources were valued (in terms of significance and use of different resource sourcing mechanisms) over foreign, which confirmed the notion that small companies are dependent on domestic and maybe rather local knowledge repositories (e.g. Freel 2003; Rilla 2009). Companies reported relying largely on their own R&D, whether carried out domestically or in foreign location/s, implying that innovation processes are rather closed, although researchers have stated that open innovation behaviour reaches smaller businesses (e.g. Van de Vrande et al. 2009). The results also support the earlier finding (e.g. Freel 2000, 2003; Narula 2004) that investment-intensive resource sourcing might not be that appealing to SMEs, but innovation knowledge is purchased from a third party without a cooperative dimension. However, long-term cooperative arrangements, like strategic partnerships, are clearly rated as the most important to transfer innovation knowledge. This is not a surprise, as it has been emphasised in the literature (e.g. Howells 1996) that innovation knowledge has high tacit character; therefore, cooperative relations are preferred.

In addition to formal transfer, firms may engage in less formal knowledge resource transfer. Yet, their use and importance tell the same story as formal

innovation knowledge sourcing. The respondents valued domestic resources over cross-border ones, except in two cases. Internationally operating firms valued foreign conferences and trade exhibitions, as well as scientific literature, in accessing innovation knowledge resources. The distributions of responses are presented in Appendix 4.

The sector that absorbed the most knowledge from overseas was life science, but it was at the same time the most internationalised as 88 percent of companies reported having foreign operations compared to the average 61 percent of the total sample. In the life science sector, 77 percent of respondents had accessed at least one overseas knowledge resource (compared to 62% in technical services, 64% in electronics and 44% in mechanical engineering), and companies were also well engaged in overseas technological and scientific knowledge implying extensive networking in innovation process. Yet, innovations in life science seemed to originate from domestic rather than foreign knowledge resources (Table 4). Interestingly, business knowledge was fairly domestic in life science as well as in all the other sectors.

Table 4 Types of acquired domestic and cross-border knowledge resources by sector

Sector		**Wishes, ideas and design**	**Technological, scientific knowledge**	**Knowledge on markets and business environment**	**Knowledge on business models and ways of action**
Life Science	Cross-border	47%	71%	71%	41%
	Domestic	71%	88%	71%	59%
Mechanical engineering	Cross-border	23%	28%	33%	28%
	Domestic	49%	56%	62%	46%
Electronics	Cross-border	46%	55%	55%	27%
	Domestic	82%	73%	73%	55%
Technical services	Cross-border	35%	52%	41%	44%
	Domestic	79%	87%	75%	71%

On the basis of the pilot investigation, the theoretical framework and research focus were modified, which again steered the design of the case

study, thus resulting in a more focused and solid analysis. This improved the validity of the research. Secondly, the pilot study provided information on selecting meaningful and interesting cases for in-depth analysis. On the basis of the pilot study, the aim was to search for innovative companies which were international and accessed both domestic and cross-border innovation knowledge resources as case examples. The life science sector was selected for the case study context because, according to the responses, it was highly innovative and very international, and it was one of the few sectors in which overseas knowledge resources were largely in use. Life science also demonstrated strong growth potential in the Finnish economy; for instance, the medical devices sector has been one of the favourably developing high-technology sectors in Finland since the mid-2000s. In 2012, growth in the sector was 22.8 percent (Finnish Health Technology Association [Fihta ry], 2013). According to Fihta's health technology trade report (2012), health technology products comprised 38 percent of Finland's high-technology exports in 2012 (EUR 4.3 billion, 2012). Consequently, it was believed that the life science context offered fertile ground to examine the interrelatedness of the innovation and internationalisation processes through the lens of cross-border collaboration better than some less-globally oriented sectors. Albeit the choice of sector was largely based on the pilot study, it was at the same time based on convenience as the author had on many previous occasions investigated life science sector companies. The case selection process will be further explored in Section 3.5.1.

The industry selection was not straightforward, but several interesting possibilities were considered the case study setting. One of the strong options was a comparative industry setting between high- and low-internationalised sectors, but this option was rejected due to the complex nature of the phenomenon (i.e. interrelatedness of processes), which might have lowered the explanatory power and generalisability of the results. Secondly, a highly interesting industrial setting to study would have been the technical service sector, which is a less-studied field, but this option was rejected due to the complex nature of innovation processes (i.e. service innovation) in the industry. This could have again complicated the fairly abstract research problem.

3.4 The case study approach

The applied qualitative research method in this research is a case study, which is suggested to be particularly suitable to study processes (Merriam 1998). The term *case study* has been applied to describe various approaches in the research literature, creating conceptual ambiguity (e.g. Merriam 1998;

Creswell 1998; Grünbaum 2007), but a common understanding is that it is a research process or method. This study follows the definition by Easton (2010, 119) who defined a case study as a "*research method that involves investigating one or a small number of social entities or situations about which data are collected using multiple sources of data and developing a holistic description through an iterative research process*".

This study approaches the process from various vantage points. It investigates entrepreneurial internationalisation and the interconnectedness of processes through several theoretical lenses, which requires the examination of many aspects within one case (e.g. inter-organisational relationships, resources, competencies, innovation, and inward-outward links). Ragin (1994) called this type of research strategy *qualitative case research*[11], as it is interested in searching for commonalities among a small number of cases. It is characterised as an intensive case strategy that employs several aspects of cases.

The main focus in case research is to understand the case by carefully assessing its functions and activities (Stake 2006). Analysis should place emphasis on examining why the case happened by adopting a holistic view on the case study (Ragin 1994; Merriam 1998). In this study, the complete approach is adopted by addressing multiple aspects of processes and their interrelatedness in one case, which provides a more holistic picture of entrepreneurial internationalisation process than looking at only one aspect of internationalisation, for instance financial development or foreign market entries.

Case study is a valid research method in context-dependent studies that require in-depth analysis (Yin 1984; Merriam 1998), and it serves as a valuable research method in situations in which the researcher has little or no control over the events (Yin 1984). Context and contextual factors are important dimensions for understanding the studied phenomenon, and a case study provides a unique opportunity for this kind of approach (Grünbaum 2007). For instance, as Welter (2011) importantly noted, entrepreneurship is highly entangled in its historical and temporal contexts, which suggests that entrepreneurial activity, such as entrepreneurial internationalisation, should be studied firmly in its context. The choices taken, and opportunities observed, are often path-dependent, which justifies the process perspective. In this study, the life science industry forms a business context in which the studied firms operate. The industry has its own customs and ways of working, as well as beliefs and norms that influence the entrepreneurs when making decisions

[11] The other two approaches Ragin (1994) described are comparative and quantitative case research, of which the former is interested in diversity and the latter in relationships of a few variables in the cases.

related to their business. The life science sector was introduced in more detail in Section 1.2. Companies are not only shaped by their business context, but in a similar manner they might be heavily shaped, for instance, by certain social contexts in which they operate (Welter 2011; Garud et al. 2014). The main informants in this study are innovator-entrepreneurs who are often identified to be dependent on their social networks with fellow innovators and/or entrepreneurs, or collaborators (Garud et al. 2014; Söderqvist & Chetty 2013). This forms a social context that becomes their reference group for actions, beliefs and values. Moreover, context is an important factor in the case study following the critical realist tradition which aims to produce information of context-specific underlying mechanisms (Easton 2010; Welch et al. 2011).

Case studies in various forms depend on the depth, or purpose, of the study. In social research, Ragin (1994) discussed intensive, comprehensive and extensive approaches to cases, which refers mainly to the number and aspects of cases included. Another way is to address the objective of the study; for example, Yin (1984) proposed three different approaches: exploratory, descriptive and explanatory. The case study strategy can be used to seek causal relationships or to explain matters that might be too complex for a survey or experiment strategy. Alternatively, it can also have an explorative nature, intended to increase the understanding of a phenomenon or to describe a phenomenon (Yin 1984; Grünbaum 2007). The objective of this case study was to examine the role of innovation-related resource-seeking in entrepreneurial internationalisation. This study is interested in identifying uncertainty events, inter-organisational relationships, and inward–outward links in entrepreneurial internationalisation as well as antecedents of the collaboration capability in this process. In Yin's (1984) classification, this study can be characterised as explanatory because it seeks to generate a contextualised explanation (see also Welch et al. 2011).

3.4.1 The case and the unit of analysis

The case study research setting consists of either a single case example or multiple cases, although a small number of cases is often preferred (Ragin 1994). This study follows the latter design as it employed five cases in total. The multiple case study design is often utilised to increase external validity and to help lower observer bias, but researchers have also argued that it achieves stronger replication power compared to a single deep case setting (see, for example Yin 1984; Leonard-Barton 1990; Fletcher & Plakoyiannaki 2011). The comparative case research designs Yin (1984) proposed aim for similar (i.e. literal replication) or contradictory results (i.e. theoretical replica-

tion). However, the objective of multi-case research is not always to compare as Yin (1984) and Eisenhardt (1989) proposed, but to gain a holistic view on the co-occurrence of commonalities (Ragin 1994; 1999) and to search for cross-case patterns (Fletcher & Plakoyiannaki 2011). Social research advocates, such as Ragin (1994), have emphasised the objective of generating knowledge of general patterns which is not possible to attain studying only one case or a very small number of cases. Often, researcher must triangulate information about several cases in order to make sense of one case (Ragin 1994). Therefore, comparable situations or cases are preferred, although the aim would not be to contrast cases but to search for commonalities. Every case should have a specific and well-justified purpose in the research (Yin 1984), to keep the aim of the research focused.

The multi-case design was selected for this study because of the rarely studied, complex research question that deals with resource-seeking and deployment in the interrelatedness of processes. It was not certain that the interrelatedness of processes in the studied companies occurred, and by tracking commonalities across multiple cases more evidence was attained of the studied phenomenon. In addition, this approach allowed observing the antecedents of capability to collaborate that could have been left unobserved in single cases since the resource-seeking strategies varied a lot between cases. It could be said that the research followed a two-step case study design, of which the first was a more traditional multiple case study setting to evaluate resource-seeking patterns, and the second was to identify capabilities stemming from resource-seeking activities. The latter setting followed the searching for commonalities logic described by Ragin (1994).

Given that it is not always clear what constitutes a case study, the literature is also ambiguous about the unit of analysis in case study (e.g. Grünbaum 2007; Fletcher & Plakoyiannaki 2011). In other words, questions remain about what should be selected to be examined. Some authors, like Patton (2002) and Yin (1984), have identified the case and the unit of analysis as the same; i.e. "*what it is that you want to be able to say something about at the end of the study*" (Patton 2002, 229). Following this logic, the unit of analysis, and simultaneously the case, are the interrelatedness of processes in entrepreneurial internationalisation in innovative entrepreneurial life science companies (Figure 13).

There are, however, perspectives which make a distinction between empirical and theoretical units of analysis, and point out that these should be separated in the study to lead to rigorous results (e.g. Grünbaum 2007; Fletcher & Plakoyiannaki 2011). The theoretical unit is understood as the case (Grünbaum 2007). Defining a unit of analysis is not simple, and it may actually change during the research process (Fletcher & Plakoyiannaki 2011),

or the study may employ several units of analysis (Yin 1984). In Yin's (1984) terminology, the latter setting is called an embedded case study. This study employed two empirical units, namely the inter-organisational relationship and the collaboration capability (Figure 13).

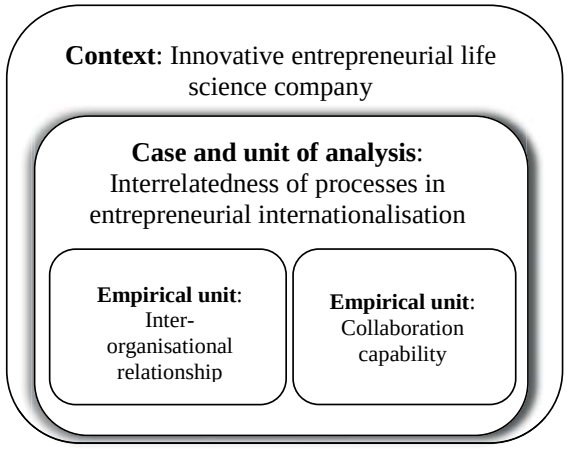

Figure 13 The case study design

To summarise the selection of case study design, this study investigates companies' entrepreneurial internationalisation in a new light by combining innovation process studies with the international entrepreneurship tradition. Experts have suggested that the case study design is appropriate when investigating a previously examined topic from a fresh perspective, or in early stage research of a completely new topic (e.g. Ragin 1994; Merriam 1998). Furthermore, according to Yin (1984), case studies can involve multiple levels of analysis, which is relevant in the present study. The main analysis level is the company, more precisely, the organisational processes.

3.4.2 Retrospective process research

This study aims at analysing multiple processes and their interaction from the retrospective point of view. However, due to the limitations in process data and process theorising, this study can be termed a *weak process study*, following the terminology proposed by Welch and Paavilainen-Mäntymäki (2014). For instance, limitations in the availability of archival material and longitudinal data collection do not support a strong process study, since capturing of the studied processes comprehensively is not achieved. The lack

of process data, in turn, inhibits process theorising, i.e. explanations on how and why patterns take place (Langley 1999; Welch & Paavilainen-Mäntymäki 2014). However, regardless of the strong or weak form, process studies are in general interested in tapping "*how and why things emerge, develop, grow or terminate over time*" (Langley et al. 2013, 1). Therefore, process research builds on explanations derived from patterns in events, activities and choices over time (Langley 1999). In turn, a process can be defined as a "*continuous, interdependent sequence of actions and events that is being used to explain the origins, continuance, and outcome of some phenomenon*" (Pettigrew 1987, 656).

To study entrepreneurial internationalisation from a process perspective is especially valid as internationalisation consists of small incremental events and decisions over time that constitute a process (e.g. Jones & Coviello 2005; Welch & Paavilainen-Mäntymäki 2014). As previously argued, internationalisation is further believed to be path-dependent, to have its unique trajectory, and to build on past decisions and experiences, all of which justifies adopting a retrospective approach. The study still includes components of the present situation since processes were on-going at the time of data collection, but this research does not incorporate a longitudinal setting as such. Given that processes are temporally evolving phenomena, process studies do not always have a clear end point or outcome as general management studies often expect (Langley et al. 2013). This illustrates one of the main challenges of process research as entrepreneurial internationalisation is a temporal phenomenon.

Moreover, according to Easton (2010), critical realism is well-suited to study processes as it is interested in the underlying mechanisms in order to inquire why things happen, i.e. what drives processes. These are interesting questions also in this study, which aims not only to detect processes but also to investigate how identified processes are interrelated. The aim is to evaluate the patterns and drivers of the interrelatedness of processes. Past events and actions, history and time are at the heart of process analysis (Pettigrew 1997; Langley 1999). This study adopts a retrospective approach which starts from the known outcome and works backwards to understand why and how things occurred (Bizzi & Langley 2012). Although the retrospective case study design provides a good opportunity to detect patterns and dynamics of processes, it also creates difficulties in determining the relations of cause and effect from the reconstructed events, as causality is observed through chains of events (Langley et al. 2013). Not only are causal relations difficult to detect, but respondent bias might also occur as informants are challenged in remembering key events sometime after they happened (Styles & Genua 2008; Bizzi & Langley 2012). However, from the researcher's own experience, it could be stated that important and meaningful incidents are usually well-remembered,

especially events related to innovation, which is the main building block of a company and its business. In addition, the multiple retrospective case research has various advantages, such as that the data gathering is relatively focused, which makes data collection efficient, and it has fairly good external validity because of its variety (Leonard-Barton 1990; Bizzi & Langley 2012).

Process research often operates with multiple units and levels (van de Ven & Poole 1995; Langley 1999); as Langley et al. (2013) noted, the process study operates rather through temporal observations than cases. This study employs two levels, namely the innovation level to track the innovation development process and the company level to identify the entrepreneurial process (incl. internationalisation events). Interrelating two processes in one study is hoped to result in a contextualised explanation, as proposed as one of the methods for theorising from case research (see e.g. Langley 1999; Welch et al. 2011; Langley et al. 2013).

Furthermore, the inter-organisational relationships act as the main temporal observations. The focus in this study is to detect the sequence, order and nature of activities and events to construct processes (Van de Ven 1992). Because the different levels are often difficult to separate and temporal observations are many, the process data can become disordered (Langley 1999). There are, however, several analysis techniques to help in organising often voluminous process data. The implemented visual mapping and temporal bracketing are examples of these 'tools' that help to analyse the recurrence and accumulation of events and progression of processes (Langley 1999; Langley et al. 2013). These sense-making techniques are introduced in detail in Section 3.5.3. Although multiple levels and units of analysis add complexity to process data, they possibly offer additional opportunities for theorising from process data to discern commonalities and reveal unexplored explanations for change (van de Ven & Poole 1995; Bizzi & Langley 2012).

This process study combines characteristics of lifecycle and teleological process studies as it employs pre-defined states of the process but is also interested in achieving a goal, i.e. international growth (van de Ven & Poole 1995; Bizzi & Langley 2012). These are argued to be theoretical motors to explain change in a process. According to Bizzi and Langley (2012), aiming to understand the theoretical mechanisms underlying the regularities leads to the theorising described as contextualised explanation by Welch et al. (2011). The visual mapping technique is said to lead to pattern development, which is suitable for an inductive theory-building strategy that does not necessarily aim to understand causal relationships (Welch et al. 2011; Bizzi & Langley 2012).

3.5 Part II: Qualitative multiple case studies

This study is an explanatory case study which aims to examine the role of innovation-related resource-seeking (i.e. inter-organisational relationships) and identify the capability to collaborate in the interrelatedness of innovation and internationalisation to explain entrepreneurial internationalisation. The main empirical part of the research consists of qualitative multiple case studies, which is a suitable method to analyse processes. At the same time, the case examples provide the opportunity to approach the phenomenon also from the innovator-entrepreneur's perspective. The next sub-chapters describe how the cases were selected, introduce the collected data, and explain the data analysis techniques used in the study. The last sub-chapter discusses the evaluation of the research design and process.

3.5.1 The case selection

Following the research design, the qualitative research was to comprise multiple case studies. The number of cases was not, however, pre-determined, but the selection was flexible and largely determined by access to the case firms. In theory, the number of cases should not be pre-determined, but the iterative process of data collection ends as the saturation point is reached (Ragin 1994). In practise, the iterative process in case selection in fairly difficult to conduct because of the laborious nature of qualitative research if not carried out as part of a larger research project as Gephart (2004) proposed to be the ideal situation for producing substantial new insights in qualitative research. This study applied not only one but several sampling techniques which Fletcher and Plakoyiannaki (2011) have noted is common in case research. According to Eskola and Suoranta (1998), selecting the case examples varies, but generally cases are the typical and representative examples of the phenomenon under investigation. A case can also be unique or a borderline example that is selected because it differs from the typical case. The former approach was followed, and the selected cases were representative examples of the phenomenon. Companies that were innovative and operated on the international market were included as case examples (see the case selection criteria in Table 5).

Table 5 The case selection criteria

	Criteria	Description
Criteria from pilot study	Firm is innovative	Firm has developed and commercialised a technological innovation (product, process or service), or the invention is close to commercialisation.
	Firm is international	Operations (e.g. trade, collaboration) in international markets, or firm is oriented to international markets since founding.
	Firm operates in life science	Life science consists of health and well-being sectors generally understood as biotechnology, pharmaceuticals and medical devices.
Additional criteria	Firm is entrepreneurial	The inventor of the innovation is closely tied to the running of the business, serving as CEO, R&D manager, board member, or in any other important role.

The case selection was based on four main criteria (Table 5), of which three were formulated based on the pilot survey while the fourth criterion of entrepreneurial focus of company arose during the selection process. The innovative descriptor indicates that the companies had developed and commercialised a technological innovation, or had passed the pilot phase and were close to commercialising an invention. In addition, in order to qualify as a case, the company must have had operations (e.g. trade, collaboration) or be oriented to international markets since its founding, and it needed to operate in the life science sector. Since the life science sector builds on a combination of different fields, defining the boundaries of the sector was challenging. This study relied on two definitions found in the literature (Eselius et al. 2008; Jones et al. 2011b; Stremersch & Van Dyck 2009). In general, life science is understood to consist of health and well-being sectors which build on core technologies of diagnostics, devices and drugs from pharmaceuticals and biologics (Eselius et al. 2008). The listing of life science sectors provided by Jones et al. (2011b) includes, for instance, biotechnology, pharmaceuticals, biomedical technologies, life systems technologies, nutraceuticals, food processing, environmental technologies and biomedical devices. The fourth criterion used was that the company was entrepreneurial, understood as the inventor's close participation in the business, as Chief Executive Officer (CEO), R&D manager, board member, or in any other important role. A simi-

lar criterion to denote an entrepreneurial company has been used in previous studies (e.g. Andersson & Evangelista 2006).

Since the study contains a pilot study of innovation sourcing in the international business context (see Section 3.3), the case examples were initially sought from the sample of survey respondents based on certain predefined criteria (Table 5). The sampling technique that followed could be labelled as criterion sampling (Patton 2002; Fletcher & Plakoyiannaki 2011) since innovative and international small- and medium-sized firms were selected based on the criteria developed from the survey results. However, this exploration in 2010 was not too successful except in one case and led to the reformulation of the case selection strategy to include other sources. In the next round, the case search was extended to non-respondents and other interesting cases outside the initial survey sample, but results were again very poor. The challenges in finding case companies in this round were mainly due to the small number of survey respondents in the life science category, cancellations, refusal to participate and unattainability of company representatives, for example, because the business had shut down. These poor results in case selection led to another change in strategy in 2011–2012. The author widened the scope for case selection to other projects performed in parallel to this study. It happened that the life science companies were also analysed in another project dealing with innovative entrepreneurship, and two more cases were added in this study. Since these two new cases were Austrian, the initial aim to concentrate only on Finnish firms was rejected in 2013. In Austria, the life science sector is very promising and has a similar environment to life science innovations and businesses in Finland. Both are regulated by the European Union, have strong industry-university R&D links and strong public support systems; therefore, the inclusion of cases from Austria was not considered problematic but as an opportunity to get additional perspectives in the study. At the same time, entrepreneurship started to develop as an important theme, although the cases were not yet systematically analysed. The author formed a pre-understanding of the interrelatedness of innovation and internationalisation in entrepreneurial internationalisation throughout the work with the same cases simultaneously in another project.

The revised case selection criteria led to a search for some more suitable Finnish cases since entrepreneurship had now been added as a central criterion. Although the new criteria emerged, luckily the existing cases also fit this new criterion since all the previously selected case companies were also innovator-entrepreneur led. Two more entrepreneur-led firms were contacted in early 2014, and both of these agreed to participate. One of these cases was selected based on previous knowledge of the company and its suitability with the study focus, and the other was based on the observation that it was an

interesting fit to the study. It can be seen from the above description that the convenience sampling strategy played an important role in case selection, as the cases were selected based on previous knowledge or contact (Patton 2002; Fletcher & Plakoyiannaki 2011). At the same time, the sampling process has characteristics of confirmatory sampling (Patton 2002; Fletcher & Plakoyiannaki 2011) since the last two cases were selected because of their good fit with the existing cases to provide richness to the analysis.

Although the data of the case companies was collected on different occasions in three different research projects with varying research themes and interview objectives, the interview themes have on every occasion concentrated on innovative entrepreneurial small businesses and thematically covered areas of innovation collaboration and internationalisation (see Appendix 5). For this reason, the material can be reutilised to answer the research questions proposed in this study.

3.5.2 Data collection for the case study

One of the major strengths of qualitative data is that it focuses "*on naturally occurring, ordinary events in natural settings*" to observe real life in its context (Miles et al. 2014, 11). Miles et al. (2014) further stressed that the use of qualitative data offers a good possibility to understand latent issues, which are often highly meaningful in process research.

The primary data was collected by interviewing the key decision-maker of each entrepreneurial firm, who in this study was an innovator, entrepreneur or CEO of the company (Table 6). Often the interviewee held more than one of the above roles which is typical in innovative and entrepreneurial companies. The author (and occasionally with a colleague) conducted the narrative and semi-structured interviews (see the interview guides used in data collection in Appendix 5). These interviews lasted from forty-five to ninety minutes, and often, if the interview was performed on the company's premises, the visit included an introduction to the functioning of the innovation or a tour of the production facilities. Therefore, the length of the visit to companies lasted often one to two hours in total. All case interviews were recorded, and transcriptions were performed by an external service provider. In addition to firm interviews, some secondary interviews with life science industry experts were performed in Finland and Austria to get information on the institutional aspects of the life science field. A list of the additional interviewees is included in Appendix 6. Primary data collection was performed mainly between 2011 and 2014 (Table 6).

Table 6 The primary data collection

Case	Firm age at the time of interview*	Entrepre-neurial age at the time of interview **	Data collection	Length of interview
MedHeart	8	-	Interview of CEO/innovator February 2013, Austria	66 minutes
MedImage	5	-	Interview of CEO/founder February 2013, Austria	69 minutes
MedBio	3	-	Interview of CEO/innovator April 2011, Finland	46 minutes
MedSignal	22	-	Interview of CEO/ innovator August 2005, Finland	43 minutes
	31	9	Interview of CEO/innovator February 2014, Finland	90 minutes
MedLife	17	6	Interview of Entrepreneur/ innovator and CEO, January 2014, Finland	84 minutes

Note: *An official age calculated from the year of registering company in the Business Register. **An age calculated from the year of the event the entrepreneurs noted as a 'revival' of the business, i.e. a reference time in the data analysis.

The age of the company, although the research setting was geared towards starting entrepreneurial ventures, was not a significant criterion in the case selection. Jones et al. (2011a) suggested that the research samples in IE should include companies of different ages, for example when studying capabilities. IE is not a phenomenon of young companies only. Therefore, two age variables are offered, an official age and an entrepreneurial age, to give an indication of the entrepreneurial experience of the company. Two of the studied companies had extensive reorganisation of operations (either innovation- or ownership-based) that CEO/innovators felt gave a fresh start to the company although they already had respective operating histories.

A systematic media search was performed in August–September 2014 to collect supplementary secondary material from the companies. The main sources were on-line press databases, such as Kauppalehti, Suomen Mediaarkisto, Talentum, Sanoma, Business Monitor International (BMI), company websites (e.g. press releases of new innovations and internationalisation events), and general official websites (e.g. public funding actors and industry associations). Companies' basic information regarding turnover rates, ownership, employees, and subsidiaries were obtained from Bureau van Dijk's Orbis

database, which offers company information worldwide. See Table 7 for information on the type of secondary material employed and the time period covered in each case. The material searches were made for the whole company histories since the establishment of the company.

Table 7 The sources of secondary material in the case study (in number of articles or press releases used in the case analysis)

	MedHeart	**MedImage**	**MedBio**	**MedSignal**	**MedLife**
Media databases: Kauppalehti, Suomen Media-arkisto, Talentum, Sanoma Business Monitor International (BMI)	1	-	5	14	7
Company website (Press releases, newsletters)	4	1	9	5	2
Other web sources	5	1	-	-	2
Other material	-	-	-	-	7
Time period	2009–2013	2012–2014	2010–2014	1988–2014	2008–2014

Table 8 outlines the types of data collected in the different phases, and further elaborates the approach and theme of the interview performed. Since the empirical evidence originates from different research projects performed by the author, the data collection approaches (e.g. interview themes) and order vary as well.

Table 8 The data collection process

Case	Phase I: Pre-understanding (visual map)	Phase II: Primary data collection	Phase III: Supplementary data
MedHeart		Theme: Innovative entrepreneurship Approach: Combined narrative approach and semi-structured interview with CEO/innovator.	Systemic media database and web search
MedImage		Theme: Innovative entrepreneurship Approach: Combined narrative approach and semi-structured interview with CEO/founder.	Systemic media database and web search
MedBio	Web search: company's press releases and webpages; media sources Existing transcribed interview material (author not present in the interview)	Theme: Innovation and knowledge sourcing in SMEs Approach: Semi-structured interview with CEO/innovator.	Systemic media database and web search
MedSignal	Existing transcribed interview material (author present in the interview) Web search: company's press releases and webpages; media sources	Theme: Innovation, entrepreneurship and internationalisation processes, and innovation collaboration Approach: semi-structured interviews with CEO/innovator	Systemic media database and web search
MedLife	Web search: company's press releases and webpages; media sources	Theme: Innovation, entrepreneurship and internationalisation processes, and innovation collaboration Approach: Semi-structured group interview with Entrepreneur/innovator and CEO	Systemic media database and web search

In three situations, the author constructed a tentative visual map (Phase I) of the company's innovation and internationalisation processes prior to the inter-

view for the basis of discussion. This visualisation was shared with the interviewee/s to comment and complement. These initial visual maps of the main events and milestones were assembled with the help of company documents, press releases and other secondary material obtained via web searches. In the other two cases, empirical evidence was instead collected via a narrative approach that aimed to get a rich description of innovative-entrepreneurs' personal history. How this approach differed from the other interviews was that the interviews were not guided by questions in the beginning, but the interviewees were given an opportunity to 'speak freely' and share a story about how they become entrepreneurs. This narrative approach was performed in combination with a semi-structured interview guide in order to also obtain detailed information about the innovation and internationalisation processes (Phase II). In Phase III, vast secondary material from web sources was collected by performing a systematic search of press archives for the company histories (see Table 7 for details). The availability of press material varied largely, and most of the early years of company lifecycles were not covered by this source. There was still sufficient material that helped to build the case chronologies and verified the timing of some events and actions related to innovation and internationalisation. Finally, the constructed visual maps were shared with the interviewees to verify the order and timing of events and actions.

3.5.3 Data analysis

Because of the chosen process approach, the data analysis employed several process analysis and sense-making techniques in order to identify the critical events, which had a crucial effect on either one or both of the studied processes and how these processes unfold over time (e.g. van de Ven 1992; Langley 1999; Langley et al. 2013). The data was processed in three steps that are depicted in Figure 14.

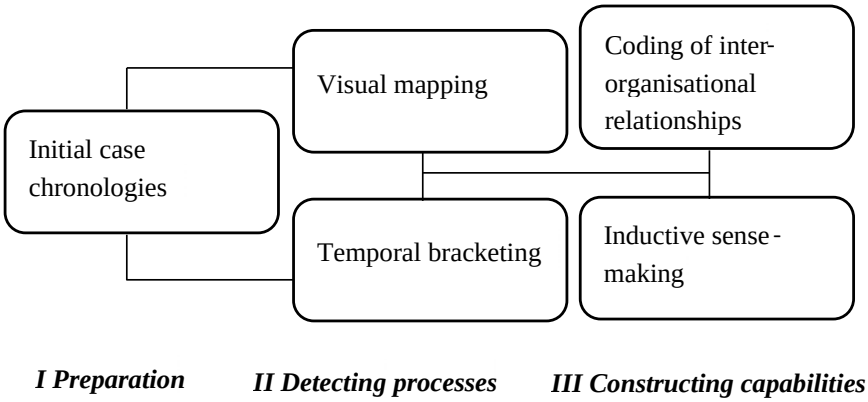

Figure 14 The data analysis process

The analysis process started with creating the initial case chronologies with the help of primary and secondary data. The main emphasis was placed on tracking the history of technological invention, innovation and the company, and creating a timeline of the main events in innovation and company histories. Given that time is an important dimension of process, it was decided to use a reference time (as indicated by time zero on the timelines) instead of picking, for instance, the year of company incorporation as the 'starting year' for the investigation (Jones & Coviello 2005). A reference time was used because it has been suggested that in entrepreneurial ventures important events and actions might take place prior to the company founding (Hewerdine & Welch 2013). This was also indicated in the interviews as entrepreneurs often expressed company history in the form of eras in the entrepreneurial lifecycle. They used expressions like 'revival' and 'fresh start' to indicate, for instance, changes in ownership, as in the case of MedSignal.

The second phase concentrated on detecting processes. The qualitative data analysis used two sense-making strategies in order to generate a detailed description of the processes under investigation (Langley 1999). Different sense-making approaches help to structure the material and define which elements given more emphasis in the analysis. As Langley (1999) described, visual mapping is useful in the beginning of the analysis process as it allows simultaneous presentation of large number of elements which can be used to picture, for instance, parallel processes. This approach also helps to pinpoint relationships with processes, and look for commonalities of processes such as events and progression (Langley 1999). Furthermore, visual mapping is a useful tool for data reduction given that process data is often laborious due to the high volume of raw data. Visualisation in qualitative research is becoming increasingly common and important for analysis (Bizzi & Langley 2012;

Halinen et al. 2013); therefore, it was seen as a feasible technique in this process study.

In this study, a visual mapping was used to visualise processes from the raw data and prepare a chronology of critical events, activities and progresses on three levels, namely entrepreneurial, innovation and internationalisation, to be analysed in detail. The entrepreneurial level was included to detect the venture creation, whereas the innovation level illustrated the events related to invention or innovation development. If the company already had international market operations, these were detected on the internationalisation level on the initial visual maps. Given that the main focus of this study is to examine the entrepreneurial internationalisation from a resource-seeking perspective, the emphasis was placed on detecting the inter-organisational relationships that the companies engaged in throughout all the above mentioned layers in the visual maps. Table 9 describes these key concepts identified in the visual maps. The tangible–intangible dimensions of inter-organisational relationships arose during the analysis, and were based on descriptions given in the interview data; whereas the other dimensions (inward–outward, domestic and cross-border) were theory-driven concepts. See Appendix 7 for examples of how constructs were deployed in the data analysis.

Table 9 Key concepts in the visual maps of entrepreneurial internationalisation process

Construct	**Description**
Reference time (0)	A critical event in the company's or entrepreneur's history.
Inter-organisational relationship	Informal or formal collaboration activity that aims at advancing entrepreneurial internationalisation process.
Cross-border	Partner is located in a country other than the case company.
Domestic	Partner is located in the same country as the case company.
Inward	Relationship brings in external resources to the company.
Outward	Relationship exploits the company's internal resources.
Tangible	Relationships are compulsory and routine to fulfil instant resource needs.
Intangible	Relationships deliver primarily knowledge resources, for instance formal and informal advice.

The inter-organisational relationships were not only assessed by the link (inward–outward) they provided but also the nature of resource companies gained via these relationships. These are labelled as *tangible, intangible* and *combined (Intangible/Tangible)* to demonstrate the nuances of collaboration and the motivation for forming inter-organisational relationships. Relationships of tangible nature are regarded as compulsory and routine-like, and they fulfil instant resource needs but do not satisfy any other kind of additional resource requirements which might arise on the spot or later. Intangible relationships again deliver primarily knowledge resources, for instance formal and informal advice, that the venture seeks to obtain. The combined form of relationship both complies with tangible resource needs and offers additional intangible advice or assistance. Therefore, the combined forms of inter-organisational relationships are important for and appreciated by starting ventures whose tangible and intangible resource needs are extremely high.

Given that visual mapping concentrates on patterns, it lacks the power to track the actual underlying mechanisms that drive activities (Langley 1999). In order to tackle mechanisms and detect underlying patterns in the process analysis, a temporal bracketing technique was also utilised (Langley 1999; Langley et al. 2013). This technique has been widely applied for instance in ethnographic and organisational change studies (see e.g. Barley 1990; Pozzebon & Pinsonneault 2005). It helped to distil the main events and occurrences in the entrepreneurial internationalisation. Yet, temporal bracketing was also used for the replication of theoretical propositions as originally suggested by Langley (1999) as one process theorising technique, and it was applied in two ways in the analysis. First, it determined the boundaries of process. These boundaries of entrepreneurial internationalisation process states were drawn from the theory. A description of how these states were operationalised in the analysis is given in Table 10. Only pre-internationalisation was strictly defined as it was the special interest of this research. The subsequent states were identified based on more qualitative assessment. Because entrepreneurial histories vary, the case companies were at different phases in their entrepreneurial internationalisation paths. The cases covered some eight to fourteen years' investigation period prior to and after the company's reference time, and all except one (MedSignal) case covered pre-internationalisation.

Table 10 Operationalising entrepreneurial internationalisation states in the case analysis

State in entrepreneurial internationalisation process	Description
Innovation process	From origin of innovation idea (e.g. scientific invention) to innovation market launch.
Pre-internationalisation	A state from start of innovation development to the first outward cross-border link (inter-organisational relationship) company employs.
Development	A state in which company increases its engagement in cross-border inter-organisational relationships to gain access to resources. Company starts investments in internationalisation (e.g. implementing internationalisation strategy); foreign sales networks are to be built.
Commitment	A state in which company is well-established in international resource partnerships (and networks) and also deploys extensively these cross-border resources. Company intensifies its investments and commitment to internationalisation (e.g. clear change in attitude); purposefully builds and nurtures cross-border inter-organisational relationships. Majority of sales accrue from international markets.

Second, after several rounds of data analysis took place to spot the main critical events in entrepreneurial internationalisation processes, the temporal bracketing technique was again applied to structure the events into temporal groups related to innovation development and entrepreneurial venture creation. At that point, the temporal bracketing was done within the limits of the entrepreneurial internationalisation process boundaries.

One of the techniques to identify the main critical events was the categorisation of inter-organisational relationships to different types, namely tangible and intangible, to judge the importance of the relationship for resource-seeking internationalisation. This categorisation was partly driven by the theoretical framework and partly by the data, as new dimensions for the inter-organisational partnerships were identified during the analysis process (Table 9). The last step of analysis concentrated on constructing the collaboration capability, when data analysis was driven by techniques that permitted greater abstraction (Langley 1999). Since the data was reduced in the earlier data analysis rounds, the capabilities were identified based on the categorisation of inter-organisational relationships according to different activities of entrepre-

neurial internationalisation and the nature of the relationship (i.e. tangible and intangible). Appendix 8 offers a description of the process of capability construction as well as an example of how the data was utilised to identify capabilities.

3.6 Evaluation of the research

This study is a qualitative mixed methods study that combines a quantitative pilot study and a qualitative case study. However, since the main focus has been on the qualitative multiple case study, the trustworthiness of the research should be evaluated with criteria suitable for qualitative research (Merriam 1995; Healy & Perry 2000; Shah & Corley 2006; Sinkovics et al. 2008; Lincoln et al. 2011). The different paradigmatic views between quantitative and qualitative research result in different evaluation metrics (Lincoln et al. 2011). It has been stated that this study adopts a realism worldview of reality which also steers the criteria for how the research should be evaluated (Healy & Perry 2000). Within realism, the reality exists 'out there' and is created by us but is largely autonomous. Since qualitative research is often judged by four metrics: credibility, transferability, dependability and conformability (Shah & Corley 2006), the same criteria will be used here. These criteria are supported with more specific mixed methods evaluation metrics emphasised by Ihantola and Kihn (2011) and Venkatesh et al. (2013).

The *credibility* of research refers to how the realities of respondents and the researcher match (Lincoln & Guba 1985; Sinkovics et al. 2008), which concerns the quality of research data and the findings. To begin, the credibility of the research process was enhanced by exploiting constructs used in the established theories and literature in the field of international entrepreneurship to start qualitative data collection. The main data sources in this study were face-to-face interviews and archival data from secondary sources. Given that the interviews were performed in different research projects, the interview themes and guides varied, which might influence the comparability of data. This is not however seen problematic in this study as case studies aim to identify commonalities rather than contrasting (Ragin 1994). Yet, the interview themes were judged to contain enough similarities on themes important to this study, collaboration and internationalisation respectively, to be qualified for this study as well. The quantitative pilot study also aided in forming a pre-understanding of important themes and confirmed the suitability of interview data while supporting the selection of a mixed methods research design (Ihantola & Kihn 2011; Venkatesh et al. 2013). In addition, it is believed that approaching international collaboration and entrepreneurial internationalisa-

tion from different theoretical perspectives gave this study an advantage rather than a disadvantage.

Second, the retrospective case analysis sets certain limitations such as getting all the details correct due to the time lag. However, as Leonard-Barton (1990) in her retrospective study discovered, the informants were likely to focus on events and actions they regarded significant. This observation was confirmed by author, who has experience in performing historical innovation process studies. The use of multiple sources of evidence, as applied in this study, is intended to overcome the challenges posed by the retrospective nature of the study as events can be verified from multiple sources, like from press releases and journal articles. The combination of sources for evidence increases the credibility of qualitative research (Sinkovics et al. 2008). Furthermore, results of the supportive quantitative and the main qualitative studies are in line and reveal similar patterns of innovation collaboration behaviour, which again enhances the quality of inferences from the mixed methods research (Ihantola & Kihn 2011; Venkatesh et al. 2013).

Only one interview per case company was conducted, although older interview material was also available in one case. This restricted number of interviews can clearly bring into question the credibility of the research. Interviewees were the innovators or CEOs of the case companies, and hence had good knowledge of the innovation and business side of the venture. It could therefore be argued that including additional interviewees might not have provided additional facts about the collaboration and internationalisation, but rather added 'flavour' to the topic. Furthermore, the tentative visual maps of innovation and internationalisation processes were shared with the interviewees for comments and additions. This strategy was designed to confirm the interpretations made from the data.

Given that the research findings deviated from the expected and that new constructs were discovered during the analysis process, it could be said that this research also passes the credibility test posed to data analysis. In this manner, the reality of the cases was conveyed as truthfully as possible (Merriam 1995). Similarly, the applied sequential design of quantitative and qualitative methods complemented and expanded the findings and strengthened the overall appropriateness of mixed methods (Venkatesh et al. 2013).

One of the most common questions in research evaluation is how well the findings of a study can be applied to other contexts and situations. This question is intended to test the transferability or external validity of the research (Lincoln & Guba 1985; Merriam 1995; Healy & Perry 2000). To judge *transferability* of the research setting, the context of the study should be assessed. The study was conducted in only one industry sector, namely in life science,

which was selected as a case area because of its known involvement in collaborative partnerships for innovation. The selection was steered by a quantitative pilot study performed prior to the case studies that included several industries and extended the evidence of small businesses' innovation collaboration. It could be said that the life science sector is a representative case for the phenomenon under scrutiny, but the industry selection restricts the transferability of results to other, less collaboration-intensive sectors.

However, a few factors may improve the generalisability of the findings given that the study operated in only one sector context. First, the five cases studied were selected from different subfields of life science, which provides variety to the analysis and improves the external validity of findings. Second, the case study setting included companies from two different countries in Europe. This fact in turn improves the external validity, as findings can be extended to a larger context, rather than restricted to a single country. Furthermore, the strong innovation concentration gives room to transfer results to innovative (high-technology) entrepreneurial companies. The use of variation has been noted to increase the external validity of research (Merriam 1995). Third, another group to which findings could be related is the international growth-attaining entrepreneurial companies, given that, in small country contexts like Finland and Austria, the conditions for internationalisation are fairly similar. These 'generalisations' are, of course, dependent on the reader's own interpretation of their suitability, which Merriam (1995, 58) described as "*reader or user generalisability*".

Realism research ultimately aims at theory building, not theory testing. This goal establishes one additional criterion upon which to evaluate the quality of research: "*analytical generalisation*" (Healy & Perry 2000). The criteria for analytical generalisation include, for instance, data collection on relevant issues which requires the identification of constructs prior to data collection. A mixed methods design is suitable to address this criterion (Ihantola & Kihn 2011), and this supportive role was performed by the pilot study, which discovered some important themes for the theoretical framework and factors to address in the case study as well as the type of data to collect. It could be stated that the external validity for analytical generalisation is at a fairly good level in this study.

Dependability corresponds to the reliability of data in quantitative research, and relates to the replication of a study (Lincoln & Guba 1985; Merriam 1995; Sinkovics et al. 2008). Dependability evaluates the consistency of the findings of the data collected. It could well be that qualitative and quantitative traditions are the most apart when assessing the reliability or 'objectivity' of the research. As Merriam (1995) noted, qualitative research intends to understand and interpret the world from the perspectives of respondents, not to create

laws to observe and measure. Scholars have expressed that the purposive and theoretical sampling techniques in case selection enhance the trustworthiness of research (Shah & Corley 2006; Sinkovics et al. 2008). This study passes the test of dependability in sampling only partly. Because of the unattainability of case companies, the study relied largely on convenience sampling but applied a purposive sampling technique in the end as well.

Following a systemic data collection protocol (recording and transcribing the interview material) increased the dependability of the research process that was applied in this study. The reliability of data can be increased by applying systemic data organisation and coding techniques throughout data analysis (Merriam 1995). This dependability test was followed, and all steps in the data analysis were systematically documented for scrutiny in case need for verification arises. These steps are also reported in the study but not exhaustively, given that the author accumulated some 90 pages of documentation of the analysis. A thorough documentation and reporting eases the replication of the study setting in other contexts, and increases not only the reliability but also the transferability of the research.

Although the research employed multiple levels of analysis (i.e. innovation and entrepreneur/company levels) and the data of process events was fairly voluminous, no specific qualitative analysis software (such as NVivo) was in use, but the data was structured manually by coding the data systematically with the help of tables for different constructs. Software tools would help organising and systematising the qualitative data (Sinkovics et al. 2008), but the amount of data in five case studies was considered manageable for manual analysis. In addition, process analysis strategies were systematically applied although not rigorously followed as analysis should also leave room for the researcher's imagination, interpretation and insights (Langley 1999).

Confirmability, or objectivity in quantitative terms, is expected to show that the data and interpretations made of it are coherently assembled and most of all outside the researcher's own imagination (Lincoln & Guba 1985; Sinkovics et al. 2008). Realism research has been described as being value-aware in contrast to the value-laden constructivist and the value-free positivist research traditions (Healy & Perry 2000). Techniques to improve confirmability in realism research relate to the triangulation of methods, sources and researchers to reach rich perceptions of single reality (Healy & Perry 2000). Two types of triangulation were used in this study, namely triangulation of method with the statistical pilot study and the qualitative case study, and triangulation of data sources as multiple data collection techniques were utilised in case studies (Jick 1979; Merriam 1995). The author was the sole researcher in the research process, even though a few interviews were performed with a colleague and the author participated in discussions with colleagues concerning the research

topic at work, in seminars and at conferences over the years. Since the case analysis was conducted by the author alone, researcher triangulation was not in place. In turn, the pilot study (e.g. survey design) was carried out in collaboration with a colleague, but results were again formulated by the author alone.

Last, the confidentiality of respondents was ensured throughout the process, and the identities of case companies were disguised to ensure confidentiality. The author promised not to reveal the true identities of the case companies before the companies agreed to participate in the study. Revealing the company identities would have increased the confirmability of the study, but this benefit was sacrificed in order to get access to case companies. However, quotations were used in the reporting of cases to strengthen the confirmability and the consistency of the research.

4 FINDINGS

This section provides case descriptions of the five cases. Each description introduces first the pre-history of the case including the background of the invention or the innovation and the entrepreneurial resources available at the founding of the company. Second, the state of each company at the time of writing is also provided. The identities of the case companies are not revealed, but invented names are used to secure the confidentiality of cases. In addition to the background of case companies, descriptions illustrate the critical events and inter-organisational relationships in companies' entrepreneurial internationalisation processes. Introducing the background information aims to contextualise the resource-seeking patterns and antecedents of capability to collaborate in the entrepreneurial internationalisation process.

4.1 MedHeart

MedHeart's invention originated in a university research project in the early 2000s when the two founding partners met. After four years of promising results in computer modelling, they decided to start developing a medical device to treat patients. They found out that similar types of products were on the market, but the invention they were developing had a novel radical operation logic which offered more efficient treatment of patients. One of the advantages was to maintain a similar operation logic to existing devices in order to ensure user friendliness. This type of invention is a so-called technology push invention which did not have a clear focus and market need in sight when the initial ideas emerged, but the application area was found fairly quickly. This radical technology has not yet been commercialised, but the market launch looks viable at the time of writing due to improved funding that enabled the start of clinical patient trials. Since the invention is a class III medical device, it requires the strictest form of clinical trials as proof of the efficacy of the device. The target customers are medical doctors and hospitals. The lengthy and eventful innovation process that class III medical devices face is illustrated in the following comment describing the start of innovation development in an unexperienced entrepreneurial company:

> *"And, looking back, I had no clue what this means - developing a class III device."* (CEO/innovator, MedHeart)

MedHeart is a university spin-off, which reflects especially in the technological focus of the company. The CEO/innovator holds a PhD in technical sciences, while the other co-founder/innovator holds a medical degree; however, neither entrepreneur had previous business experience. In fact, the founders offered the invention to a foreign company at first, but the inventor contract expired due to the unavailability of resources of the intended partner. The co-founders faced a situation in which they either had to let the promising technology go, or found a company. They decided to pursue the latter option and started to advance the innovation themselves the first four years with their limited resources.

MedHeart has a proactive approach to internationalisation and growth since, like radical technologies in general, its technology is aimed at a global niche market because it does not have a sustainable domestic customer base. Because the medical condition that the device aims to treat is more common in the Western world than in Asia or the Far East, the company's main markets will be in Western regions. In 2013, MedHeart employed around 12 employees, and its core collaboration partnerships were formed with local organisations and foreign partners from the close region.

4.1.1 Critical events in MedHeart's entrepreneurial internationalisation process

Prior to setting up MedHeart in the mid-2000s, the co-founders participated in a business plan competition organised by the local public agency and gained advice and encouragement on the journey they were about to begin. After three years of official incorporation, the company received public seed funding and was able to start business. At the same time, the company changed its name to better describe the technology they were developing. Meanwhile, lucky changes in the external environment created opportunities for MedHeart as a large US company acquired two small start-ups in the same field that opened the market for the technology. In the same year, MedHeart also finalised the first prototype of the device and was able to conduct animal trials that were important milestones in the innovation process. Although the company was registered three years earlier, the reference time in MedHeart's venture history is set to the time when all these progressive events occurred and the company was able to start its business (Figure 15).

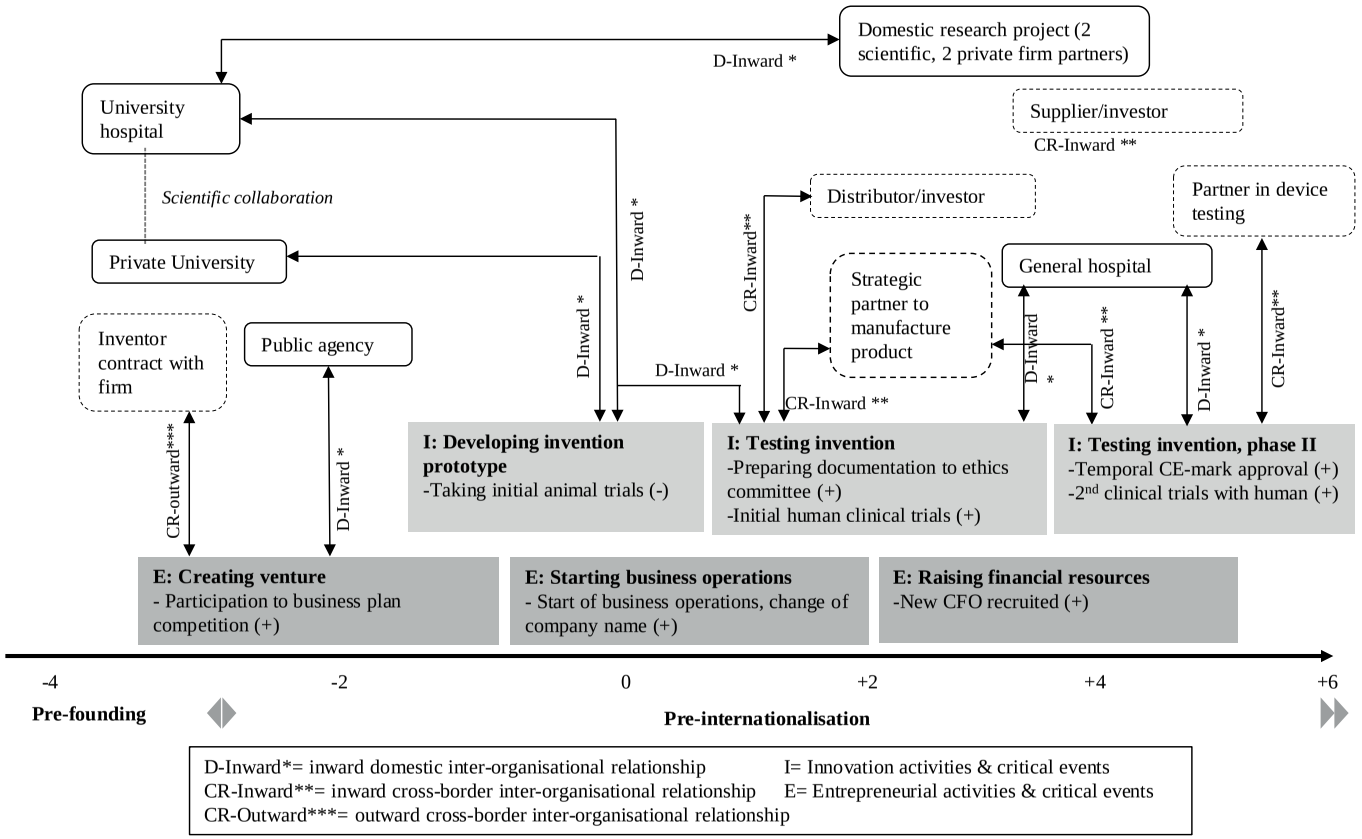

Figure 15 The visual map of events and inter-organisational relationships of MedHeart

Animal trials did not work as planned, which slowed down the development. Eventually, the second prototype with an improved treatment method was ready, and MedHeart could start to prepare for the first human clinical trials with its external partners. Before doing so, it had to find a manufacturer for the device as the company did not have facilities to build the innovation for human application. While the company was preparing the documentation for clinical patient trials, the European medical device directive changed to require even more clinical proof of not only safety but efficacy for a CE mark. As a result, MedHeart had to include additional resources to manage these tightened requirements, meaning more patient trials, more clinics and more funding. Simultaneously as technology development progressed, the company faced entrepreneurial challenges as financial resources were running out and public financing diminished as the company moved closer to market. The inexperienced CEO/innovator was frustrated since time was mainly devoted to fundraising due to the company's earlier unsuccessful recruitment of a CFO. The CEO/innovator felt that internal resources could be used more wisely. This situation improved as MedHeart employed an experienced person dedicated to raising some additional funding to move on to the next stage of human clinical trials, which took the company one step closer to commercialisation. In order to carry out the second set of clinical patient trials, a temporal CE mark was needed, which MedHeart managed to file with the help of an experienced foreign partner.

4.1.2 Forming of inter-organisational relationships in pre-internationalisation

The total analysis period covers ten years of MedHeart's history. Given that MedHeart is developing a class III medical device, clinical patient trials are required, which entails a long innovation process. The invention took place four years prior to the start of business (i.e. reference time), and technology was gradually developed in parallel with setting up the venture. MedHeart is currently in the pre-internationalisation state which is calculated to start from innovation development, which refers to the time when the company makes the decision to develop an invention to innovation and commercialise it. In MedHeart's innovation process, this happened three years prior to the start of the company's business operations.

Like university spin-offs at large tend to do, the core scientific partnerships of MedHeart are formed with the host organisation. It has maintained strong R&D collaboration relationship with the co-founders' local institutions, i.e. a university hospital and a technical university. Both co-founders retain posi-

tions in their old organisations. Technical knowledge gained from the university was important in order to get the first prototype developed, but the value of having relationships with educational organisations is well-stated in the following comment of the CEO/innovator of MedHeart:

> *"The most important source of good people in my opinion are students. Because, in the start-up phase, where you don't have a lot of perspective, you don't have a lot of money, you need something else, and this is motivation. These are dreams. Only young people are open for this."*

In the life science sector, other important collaboration partners are university hospitals because of the resource needs during the innovation process, for instance for performing clinical trials. Although external resources are easily available in a company's inner circle of inter-organisational relationships, the intangible needs are not always fulfilled in a manner intended, as explained by MedHeart's CEO/innovator who described the difficulty in getting direct feedback from the doctors operating on the patients. A conflict of interest prohibited MedHeart from performing patient trials with internal resources, and they had to use busy external medical doctors and chase their feedback to improve the device.

One great challenge for starting ventures is to orchestrate the manufacturing process, which often requires not one but several partners. For MedHeart, finding a partner to bring the device to patient trials was another critical event it had to address due to its lack of internal facilities. MedHeart found a partner from a neighbouring country, which was able to manufacture the product and provide assistance in the regulation issues MedHeart was facing. This manufacturing partner had vast experience in medical regulation; in addition, it understood the needs and challenges of the new venture. Due to the tightened EU regulations, MedHeart had to find a solution to perform additional patient trials within a limited budget. With the help of their manufacturing partner, they came up with a solution to apply a temporal CE mark for the device. This partnership grew more strategic to MedHeart than was initially foreseen.

4.1.3 Inward–outward links

Because of the unfinished innovation process, MedHeart's inter-organisational relationships are inward type, which means partnerships are formed to acquire external resources to progress with innovation development. For this reason, MedHeart has not yet developed formal outward, commercialisation-related relationships. MedHeart has actively built cross-border relationships with production partners, of which two have also made an investment in the company.

The involvement of the first investor, two years after the start of the business, came at a critical stage when MedHeart was translating the invention into clinical use, and needed to source various external resources from testing to manufacturing. In contrast, the other cross-border investor is one of MedHeart's suppliers, which became involved with the company out of pure interest in the scientific side of the invention but also offered critical financial resources for MedHeart to proceed in innovation development.

Table 11 summarises the critical inter-organisational relationships observed in MedHeart's entrepreneurial internationalisation process. Inter-organisational relationships are divided by function: R&D, venture creation, manufacturing and commercialisation. Relationships that relate clearly to developing the technology and innovation are typified as R&D, whereas the venture creation category includes relationships involved in developing the business, e.g. incorporation of firm. The other two functions, manufacturing and commercialisation, are also important in small ventures as they seldom have in-house production or resources to launch radical technological innovations on their own. The commercialisation category refers to all relationships for launching an invention to market and organising domestic and foreign sales. If a cell is blank, no inter-organisational relationships of the type were identified in the case.

Table 11 The observed inter-organisational relationships in MedHeart

Case	Function / Type	**R&D**	**Venture creation**	**Manufacturing**	**Commercialisation**
MedHeart	D-inward*	Tangible; Intangible/ tangible (connections to host organisations)	Intangible/ tangible (motivation); Tangible	-	-
	CR-Inward **	Intangible/ tangible (R&D, certification; regulation); Tangible	Tangible; Intangible/ tangible (advice of start-up)	Intangible/ tangible (manufacturing, motivation)	Intangible/ tangible (R&D, sales)
	CR-outward ***	Tangible	-	-	-

D=Domestic, CR=Cross-border

When seeking supplementary resources outside company boundaries, the primary objective is often to overcome a challenge the company is directly

facing, for instance to manufacture or distribute the innovation. For this reason, there are many tangible inter-organisational relationships identified in the entrepreneurial internationalisation process, as MedHeart's case indicates. It is however notable that MedHeart has been able to build several important relationships that have intangible characteristics in addition to meeting tangible needs. These relations are difficult to form, as pointed out by CEO/innovator of MedHeart when describing the common problem of finding good partners:

> "*You find a lot of people, consultants. Most of them are not worth the money you spend, you know? The big problem is really finding those guys who also possess the expertise and … this cooperation with* [firm name] *was very important.*"

For MedHeart, the collaboration with a foreign manufacturing partner did, little unexpectedly, provide valuable help in other critical steps in the company's entrepreneurial internationalisation path. This finding shows that companies that engage in cross-border inter-organisational relationships not only satisfy tangible resource needs, but they have identified partners who provide them with intangible resources. MedHeart has been able to exploit cross-border inward links efficiently despite having only a few partners. These relationships are intense, meaning the combined tangible and intangible resource flows in different functions.

4.2 MedImage

MedImage's innovation emerged from university research in the early 2000s, when two of the founders started to develop a solution to a problem they had encountered in their medical practice. Because the innovation was based on a recognised need, it can be described as a market pull innovation. The innovation offers an original way to treat patients and give a more accurate diagnosis compared to existing devices. This new to market radical innovation was commercialised after eight years of development. The innovation is a class I medical device, which does not require heavy clinical trials. However, as with any medical device, patient studies to show the safety and efficacy are helpful in commercialisation. MedImage's innovation was aimed at the international market from the beginning due to the restricted size of the domestic market. The main customers of the innovation are hospitals.

MedImage was established in the mid-2000s, but it took a couple of years to get the innovation ready to launch on the market. In the same year of innovation commercialisation, the company was transformed into limited form. The founding team consisted of two physicians with long careers at university

hospitals and a newly graduated CEO/founder who also had some experience in working abroad. The CEO/founder held a business degree, but none of the founders had previous entrepreneurial experience.

MedImage is a university spin-off that maintains strong relations to university research via its co-founders. At the time of the interview, the company had ten employees, of which half were full-time workers of the focal firm while the rest were employed in the partner organisations. Since demand already existed, the overseas sales to Japan and European countries from the same language area were realised in the very same year as the innovation was introduced to the market. A year later, the company adopted a more strategic approach to expand in international markets. MedImage has been very proactive towards international growth that has resulted in a distribution network covering most of the European countries and a large part of Asia as well as extending to the Middle East in the five years since the innovation was commercialised. Although the company is prone to internationalisation, it prefers organic growth, as the following statement of MedImage's CEO/founder reveals:

> *"As long as we can help ourselves with funding, we use that. But investors would be the last, just to have the freedom and, yeah. Picture-wise spoken, it's more like a playground for them* [co-founders]. *With this company he* [one of the medical doctors] *has the chance to realise his ideas, I mean, they work."*

In 2013, the company had three product lines based on the core invention, and was expected to launch the fourth one in the following year. R&D collaboration partnerships, at the time of interview, were largely local with some important partners from the neighbouring country.

4.2.1 Critical events in MedImage's entrepreneurial internationalisation process

The first critical event in MedImage's history took place when the two co-founders met and had an idea for the innovation they started to proceed. The innovators' desire for science kept the innovation process alive for the next four years until the first prototype was ready and patient tests could begin. The initial patient test went well, and pushed the business side forward as well. Venture preparations progressed rapidly, and soon the co-founders ran into a possible candidate for taking a CEO position in the company through their social networks. However, the potential CEO rejected their offer as they lacked financial resources and the innovation prototype was not fully finished either. The prospective CEO decided to take another position abroad instead,

but this small setback pushed the co-founders to improve the innovation. A year later, they again asked the CEO to join, and their offer was accepted. This resulted in MedImage's incorporation. It took two more years to prepare the CE mark certification to launch the innovation on the market and start business operations. Together, these events formed the critical point in the entrepreneurial internationalisation path which is assessed as the reference time in MedImage's timeline (Figure 16).

Due to its flexible and experimental approach to R&D, the company was quickly able to develop its next product line, three years after the first one. This development was followed by a third product line one year later. Although the international market for the innovation had been open since the launch of the first innovation, and Asian markets in particular had developed well for the company, an event organised by a domestic hospital that was already a MedImage customer made a significant impact on the recognition of innovation.

> "*We really convinced them* [the domestic hospital] *about our devices, and they organised a workshop with 30 medical doctors from Europe. That was really valuable. Basically they didn't want to make it a sales event. If you organise a sales event, first, nobody will come and, second, the congress organisation will not be happy as they don't want to have these sales events. And there were also these lead users, basically what we are looking for in Europe at the moment. So that was really good."* (CEO/founder, MedImage)

The medical technology sector is known to be rigid, lead users are difficult to reach and sales are challenging to close due to long processes, but sometimes serendipity plays a role and opportunities arise without planning. Congresses and exhibitions are the traditional marketing channels, but sometimes lead users are better reached via more scientific marketing-oriented channels like the example of MedImage illuminates.

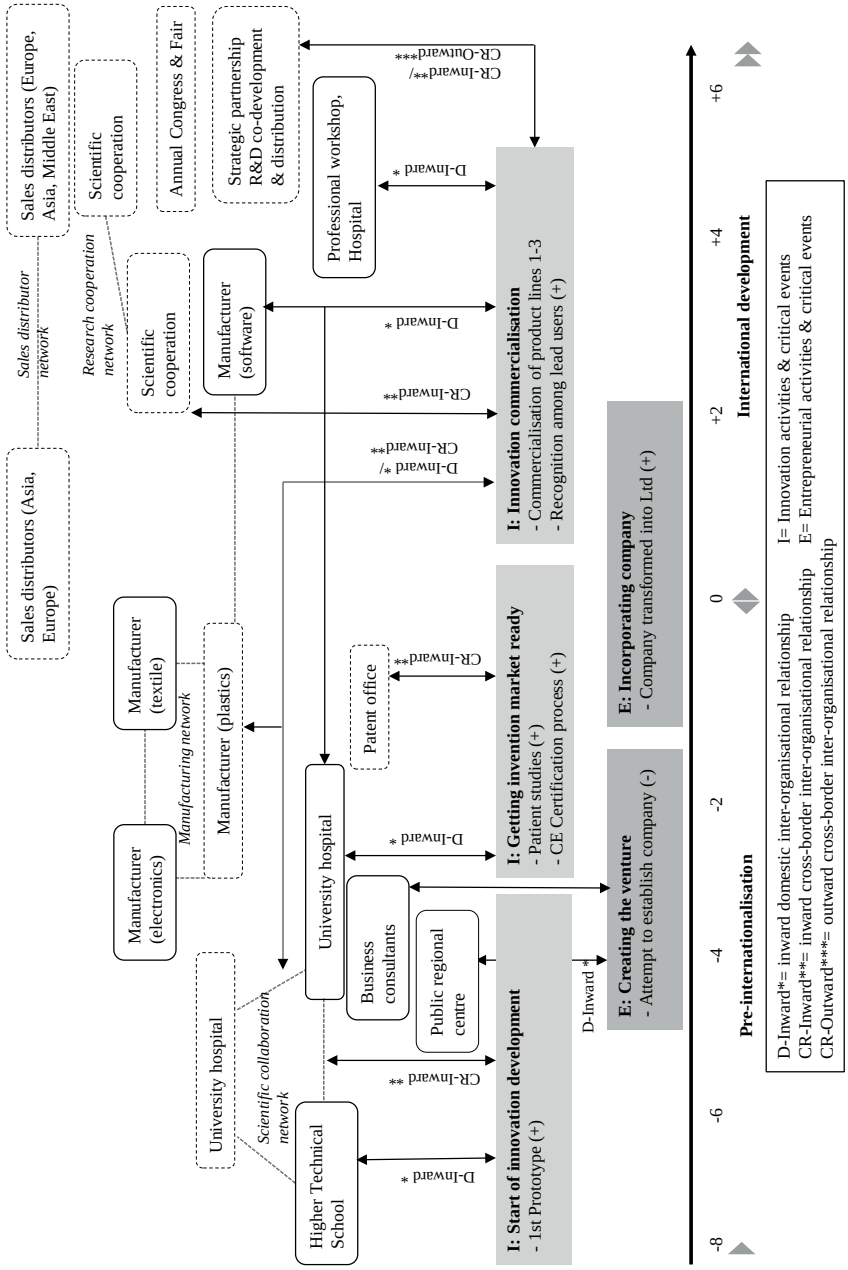

Figure 16 The visual map of events and inter-organisational relationships of MedImage

4.2.2 Forming of inter-organisational relationships in pre-internationalisation and development states

Innovation development at MedImage was initiated six years before the company was incorporated, which determines the starting point of the company's pre-internationalisation. It took another two years for MedImage to get the product to market and fully commence business operations. The company's international sales began the same year, which marks the end point for the pre-internationalisation state. Altogether, we can observe 14 years of MedImage's history.

Since MedImage's innovation process started six years before incorporation, many of the important inter-organisational relationships were formed prior to venture creation. The company has strong scientific relations to the local university hospital as well as a university hospital in the neighbouring country, both of which resulted from the founding partners' university research. Yet, when testing different prototypes in the beginning, the company required technical resources to develop innovation. These external resources were found in the local technical school. At large, additional resources are sourced from universities and are often maintained through publicly funded research projects that companies form.

> *"And with this project, we also were able to fund the scientific employees. And that's, especially if you develop this device, it's new, so, we will need scientific publications also. I call it scientific marketing in the end of the day. And also in selling these devices, it's always good to have some kind of publication or medical proof. Okay, it works."* (CEO/founder, MedImage)

Yet, the links to universities were not maintained only to get access to additional resources, but to use these links as outward sales channels as well.

> *"It was better that the medical doctors stayed at the clinic, they stay to their science. Basically the professor is my most valuable sales manager."* (CEO/founder, MedImage)

Later, in innovation development and commercialisation, MedImage established relationships with foreign research organisations to cooperate in research and exchange experiences of innovations they were developing. These inter-organisational relationships brought information on testing and functioning of the devices and backed up the scientific collaboration partnerships.

Relationships with manufacturing partners were also formed in the beginning of the innovation history when the first prototype was produced. MedImage collaborates with four main manufacturing partners, and only the

final testing is done in-house. Manufacturing requires external resources, but these resources are not always readily available. In this case, mutual learning of the partners needs to take place. This was the case with MedImage, who faced some challenges in identifying the manufacturing expertise necessary for a new technique it had developed. Finding a competent partner was critical for the innovation process to continue.

> *"Finally we found somebody, and they also, at the beginning they weren't really happy about it. They were interested because it's new, innovative and something different. But basically in the beginning, they also had to learn how to build this stuff. And it was also new for them to use it in the medical industry."* (CEO/founder, MedImage)

A clear market demand for innovation and the company's proactive approach to international sales and marketing have showed positive results in the international development state, to which the company entered when its innovation was commercialised. Ever since, MedImage has actively built its distributor network with the help of regional Chambers of Commerce.

> *"The distribution partners, that's also a story in itself. There are the good, the bad, maybe also the ugly. Maybe just, 10 to maximum 20 percent, they are really the good ones. It's pretty hard to find good ones. And then, yeah, give them maybe a year and if nothing happens, just try to get somebody else."* (CEO/founder, MedImage)

> *"I was contacted by an Indian medical distribution company. … The Indians, that's also very funny, how they do business. The person said, we don't need contracts or anything … a little strange. So, I called the Trade Chamber in New Delhi. I explained the situation, and asked can you visit this person or this company, just to have a look and check. They did and it was fine."* (CEO/founder, MedImage)

As the above quotes indicate, identifying and relying on external sales resources can sometimes be frustrating to a company, especially when a venture is new in the business. Experience and creativity will still aid in exploiting the existing inter-organisational relationships and developing the new ones.

After a few years of regular attendance at medical fairs and exhibitions, as is the custom in the life science sector, MedImage formed a strategic R&D collaboration and distribution relationship with a foreign partner. Given that this inter-organisational relationship is new, the impacts cannot yet be evaluated, but, according to MedImage's CEO, the match between partners' technologies seems very promising, and the door to an important market area is ajar.

4.2.3 Inward–outward links

In addition to formal inter-organisational relationships that have provided tangible resources (Table 12), relationships to fellow entrepreneurs were also important for MedImage in early pre-internationalisation as well as later. Starting entrepreneurs appreciate informal advice or just the intangible support from local public actors and firms, as expressed by the CEO/founder of MedImage:

> "*Especially for the small ones, it's always good to have somebody who just gives you a little bit of this community feeling.*"

As a new inexperienced venture, the sharing of experiences is beneficial. However, in some cases, collaboration is not as straightforward, for instance with a competitor, and a formal non-disclosure agreement (NDA) might be required.

Table 12 The observed inter-organisational relationships in MedImage

Case	Function / Type	**R&D**	**Venture creation**	**Manufacturing**	**Commercialisation**
MedImage	D-inward*	Tangible	Intangible (networks of peer entrepreneurs)	Tangible	-
	CR-Inward **	Tangible	-	Intangible/ tangible (mutual learning)	Intangible (contacts to lead users; workshops; exhibitions)
	CR-outward ***	-	-	-	Tangible
	CR-inward-outward ****	Tangible (distribution)/ intangible (R&D)	-	-	-

D=Domestic, CR=Cross-border

MedImage has not only been forming tangible resource-seeking relationships, but has creatively combined its foreign R&D collaboration partnerships with distribution as well. Combining its inward and outward links in relationships did not materialise in the nascent years of company life, but emerged after years of operation, emphasising the importance of experience in forming these combined links in the entrepreneurial internationalisation process.

In addition, although partnerships in production often seem quite straightforward and form to meet the resource gap, some ventures have created more advanced relationships with manufacturers which have grown highly important to companies. For instance, MedImage was able to find an experienced manufacturer and benefit from mutual learning to progress in the innovation process.

4.3 MedBio

MedBio has developed a radical innovation that holds unique functions compared to competitors' products. The innovation substitutes the existing products available on the market and offers improved treatment methods. The technology behind the innovation has travelled a long way, since it was previously developed in two companies, both dedicated to commercialise university research. The technology itself originated in the early 1990s in domestic university research, but the basic invention has much longer international roots. The focal invention can be traced back to the late 1960s. Due to its strong scientific background and unclear application areas in the beginning of the development, the original innovation can be labelled as a technology push innovation. The current activities of MedBio are market-oriented, and the new innovative applications are strongly based on market demand. It took more than ten years' development to get the first application of the innovation commercialised in the mid-2000s, while the technology was still in the custody of another domestic company. Some five years passed, but the innovation did not succeed despite its novel features. MedBio eventually bought the innovation through a management buyout (MBO) in the late 2000s. The innovation's main customers are hospitals, and it is categorised as a class III medical product, which requires extensive clinical trials.

MedBio inherited the existing collaboration and sales networks from the host company that were partly initiated by MedBio's CEO/innovator, who had worked in the international marketing of the innovation for two years before the MBO. MedBio's CEO/innovator, who held a doctoral degree in biochemistry and had a business education, had also worked on the R&D of another technology in the host company for two years. Prior to joining host company, he had gained work experience in central Europe.

At the time of the interview, the company had two product lines based on the core technology, and a new application area in the pipeline to be launched the following year. MedBio employed ten employees, and its external resource relations were well-structured, including many domestic and foreign partners. The innovation had reached the international market since the launch, and

prior to the MBO international sales accrued mainly from Eastern Europe. At the time of writing, the distributor network had grown to over 30 partners, including distributors from all continents.

MedBio executes the strategy the company was created for, i.e. rapid growth by extending the international sales network; therefore, it has had a very proactive attitude towards internationalisation and growth since the beginning. This strategy was feasible as the main product was developed and commercialised before the venture was established and more resources could be devoted to advance internationalisation.

However, new ventures face challenges in growing, for instance in evaluating the timing to take new technologies in-house.

> *"You have to extract as much as you can from your organisation. And you have to do this fast in order to get company fly. When you break-even, then you have an opportunity to look for new technologies."* (CEO/innovator, MedBio)

For a starting company, even one that has external resource stock, growth is challenging to manage as the window of opportunity is short and resources are limited to distribute to different operations at the same time.

4.3.1 Critical events in MedBio's entrepreneurial internationalisation process

MedBio's core innovation was developed and brought on the market by a company who possessed the technology previously. For this reason, events critical to MedBio's entrepreneurial internationalisation process relate more to commercialisation than innovation development. See Figure 17 for a visual map of critical events in MedBio's formation and growth path. MedBio was created when the future CEO/innovator got involved in the global sales and marketing of the core technology, and began to prepare a marketing strategy for the innovation. Four years after the innovation reached the market, the customer base was still mainly domestic and international sales were developing poorly. This was not an ideal situation for a promising technology; it needed stronger clinical data and a solid marketing plan that took two years to prepare. The same year that the marketing plan preparation began, the innovation received FDA clearance, which opened new avenues. Still, although the core technology was good and the market needs looked lucrative, a critical evaluation had to be made on the potential applications as scarce resources challenged the development and commercialisation of multiple innovations at the same time. In the middle of strengthening the innovation, an opportunity to

buy the innovation occurred and a third company to take the innovation forward was established. This MBO sets the reference time in MedBio's case.

One year later, the MBO was completed, and MedBio was able to start executing its strategy, commercialising new applications and strengthening the internationalisation of the promising technology. Focusing R&D on applications in which MedBio had a competitive advantage resulted in a second product line three years after venture establishment. One year later, the product line received European-level sales approval.

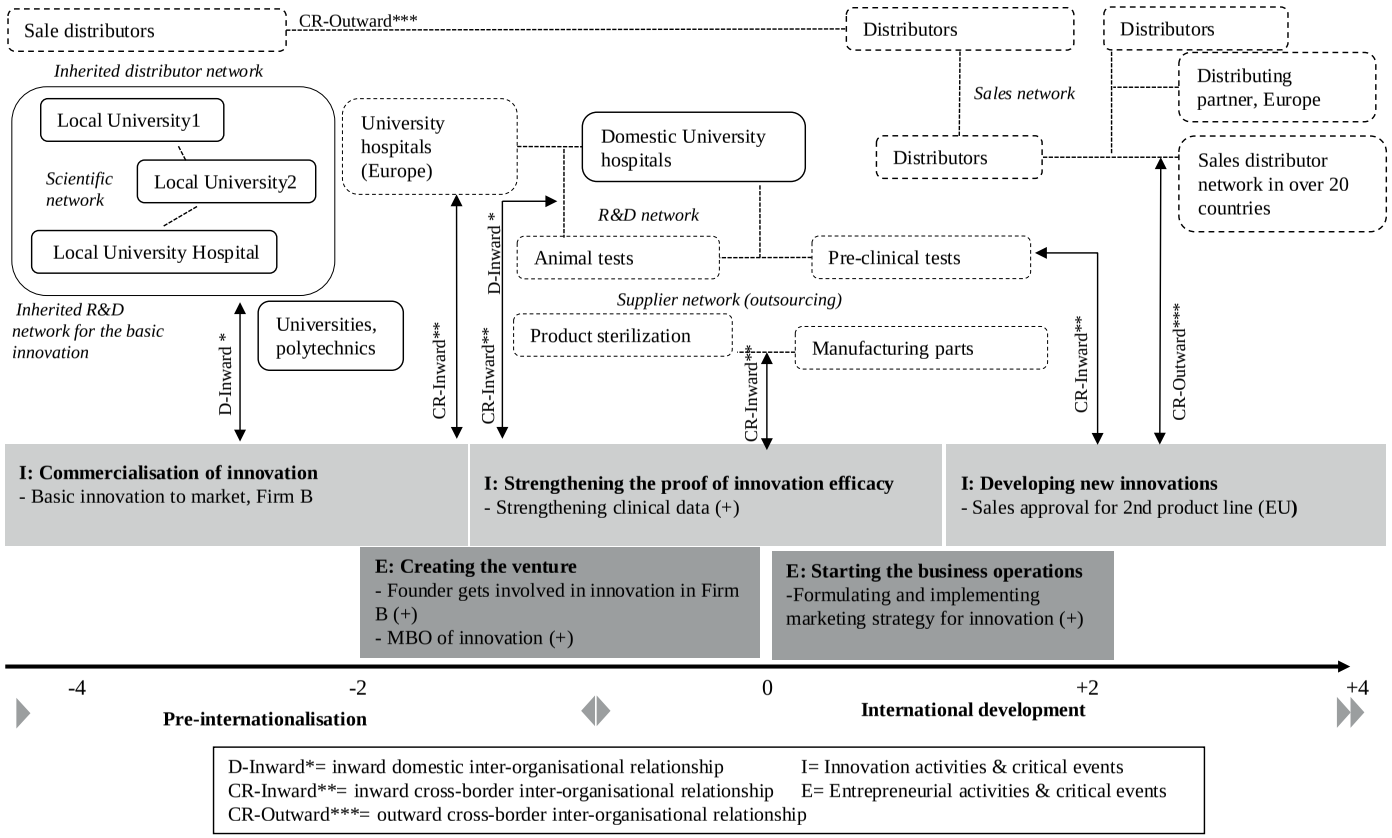

Figure 17 The visual map of events and inter-organisational relationships of MedBio

4.3.2 Forming of inter-organisational relationships in pre-internationalisation and development states

MedBio's novel innovation had foreign customers since its commercialisation, but the sales were, according to MedBio's CEO/innovator, very fragmented and the internationalisation strategy was lacking. Therefore, the pre-internationalisation state lasted until the international marketing strategy for the innovation was initiated by the forthcoming CEO/innovator one year before the reference year. In technology ventures, some inter-organisational relationships travel with the innovation, as was the case in MedBio. The company inherited strong scientific relationships with the local universities, which had developed the technology upon which MedBio's innovations were based since the 1990s. Regular contact with universities and university hospitals is important to maintain dialogue for new applications as the need arises from doctors. The CEO/innovator of MedBio explains this necessity when describing their domestic and central European university contacts:

> *"Yes, we have domestic customers, but it gives fairly restricted view on the need. Bulk of our research and development is done domestically, but ideas do come from abroad. … So you have to assess whether there are similar needs in different countries, or is the need only for one country."*

MedBio collaborates with universities to get ideas to development as well as to create need for its new products, but local universities act as technology incubators, too. By exploiting these relations, MedBio is able to acquire interesting technologies for its portfolio when the time is ripe for new applications. MedBio acts as an intermediator between market demand and science push, as its role as a technology transfer company suggests.

The company's products are produced in-house because of the high standards required for product quality and processes, but MedBio has outsourced parts of product development and production to different locations.

> *"It is completely impossible to operate as a small company in our field if you don't outsource. We have product sterilisation in Belgium, and animal tests in Switzerland, and so on.*" (CEO/innovator, MedBio)

The role of MedBio was to improve the commercialisation of the technology it acquired; since the implementation of this strategy, MedBio has decisively expanded its international distributor network. After the establishment, MedBio's resources have been engaged in finding distribution partners. This work was largely done by the CEO/innovator alone with some help from

the existing partner network. The CEO/innovator described the situation in the following way:

> *"…distributor is an old stager who has been in the field over 20 years, and knows the whole business, worldwide. You just need to have these good partners, and then expand through them."*

Some relationships grow to fulfil different needs and offer resources inward and outward, like the distribution partner example illustrates.

In MedBio's case, the proactive approach to international growth has resulted in a positive outcome as the sales network has expanded steadily. After three years of hard work following the company's establishment, MedBio's products were already sold in some 20 countries. Inter-organisational relationships accrued during the pre-internationalisation were mostly inherited with the technology that gave MedBio a pre-start as a new venture to set up international supplier and R&D partnerships. The company was able to move on to the entrepreneurial internationalisation path quickly. Yet, some of these relationships travelled with the entrepreneur as well due to his history in the host company. Companies might face some doubts in utilising external resources, as these two quotes by MedBio's CEO/innovator reveal:

> *"I have spoken with several consultants, I mean many. They have offered help to assist for instance in France. We have had some of these projects. I won't touch these anymore, ever. You just have to do the job yourself. You cannot outsource your contacts. It is so that business development has to be done by you."*

> *"You need a clear understanding of the basic business and direction. You have to understand the movements of competitors, where you want and is feasible to go. You need to collect* [tacit] *information of different markets and also assimilate that information."*

Although the attitude to outsource and use external resources is open, companies to not always see the dependence on external expertise as feasible. In an entrepreneurial company, organisational learning does not accumulate if there is no willingness and room for learning-by-doing.

4.3.3 Inward–outward links

Relationships with subcontractors and suppliers are some of the most important relations since none of the case companies had internal resources to manufacture fully their innovation. Still, final assembly is often performed internally. MedBio is one exception in this category, as it has production in-house, although it has several foreign subcontractors to which it outsources some of the production activities. The straightforward attitude of interna-

tionalisation maintained by MedBio reflects possibly in the types of inter-organisational relationships observed (Table 13). The starting point of the company's development was quite different to many new ventures.

Table 13 The observed inter-organisational relationships in MedBio

Case	Function / Type	R&D	Venture creation	Manufacturing	Commercialisation
MedBio	D-inward*	Tangible; Intangible/ tangible (university hospitals)	-	Tangible	-
	CR-inward **	Intangible (customers; contacts to foreign universities); Tangible	-	Tangible	Intangible/ tangible (new partners identified)
	CR-outward ***	-	-	-	Tangible; Intangible (contacts)

D=Domestic, CR=Cross-border

Most of the formed inter-organisational relationships have fulfilled a specific resource need, and MedBio has not formed relationships that would have served as inward–outward links in entrepreneurial internationalisation. Some of the longer lasting inter-organisational relationships, for example with local domestic university hospitals, have satisfied both tangible and intangible resource needs. Yet, the company has formed inward cross-border relationships for many functions, and its foreign partnerships for innovation and especially for commercialisation are well-established.

4.4 MedSignal

The core invention on which MedSignal's innovations are grounded originated from the founder's master's thesis work at the local university in the early 1980s. Because of its strong science and university background, the innovation was originally pushed by science rather than pulled by demand, offering an opportunity to discuss technology push innovation. Technology provided a radically new method and approach to the existing medical technology field that has resulted in a vast array of innovative applications. Although the need for the invention was not clear in the beginning, the first application was developed within a year and sold to hospitals, research organisations and

universities. The demand for MedSignal's innovations is still formed by the same core customer segment. Like all the rest of the company's innovations, the first innovation is a non-invasive class II medical product that does not require excessive clinical patient trials.

Since founding, MedSignal has developed and successfully commercialised four main innovative product lines and several improved product generations. Yet, it took some 20 years of development to get devices to resemble those visions the young entrepreneurs had in the early 1980s. Back then, technological solutions were not available to produce envisaged innovations, but gradually MedSignal paved the way for innovative products that have changed the company's focus from the business-to-business market to consumer products. The initial but improved innovations are still on the market. This transformation period was observed in the present study, and forms the main reason to include this veteran company as a case example.

MedSignal was originally a university spin-off. The CEO/innovator held a university degree in physics. Because an innovator founded MedSignal as a fresh university graduate, no previous business background existed; however, interest in entrepreneurship runs in the innovator's family. Since the other founding members also shared a university background, solid scientific expertise was guaranteed but business experience had not yet accumulated. The typical risk-taking characteristic related to technology entrepreneurs can be seen in the desire to create new things, as commented by the CEO/innovator of MedSignal in 2014:

> *"It is exactly that dumbness what is needed* [in entrepreneurship]. *Luckily I didn't know the amount of work ahead."*

In the mid-2000s, changes in MedSignal's ownership took place that gave a re-start to company. The CEO/innovator executed an MBO, and ownership of the company was shifted from investors to the CEO/innovator and employees. After a long, eventful history of being a pioneer on the market and gaining credibility slowly, like so many other innovative ventures do, MedSignal grew to dominate a global niche market. At the time of writing, it is still a small innovative technology company that operates in the electronic medical and therapeutic device sector, employs some 20 people and owns one domestic subsidiary. About half of the personnel work in R&D, and the CEO/innovator is also tightly involved in R&D, while managing the global business.

MedSignal has built extensive collaboration linkages with domestic and international partners over the years. The network includes, for instance, many foreign university partnerships, some of which have been maintained for years. Due to its early start in international markets, MedSignal has gained extensive experience in internationalisation. The first international sales took place just two years after the first innovation was commercialised to the

domestic market. In the beginning, the international sales network consisted of some four central European partners, but customers were located in the US as well. For some 15 years (from the 1990s until late 2000s), Japanese research institutions and university hospitals generated a majority of the company's international sales. At the time of writing, MedSignal's global sales network includes over 30 distributors. Internationalisation has been evident since the start of business because of the restricted size of the domestic clientele of hospitals and research institutions for its early products.

> *"We had desire and will to leave. I've always had an interest to bear up out there* [on international market]*."* (CEO/innovator, MedSignal 2005)

Yet, international growth has been slow regardless of this proactive attitude since the start of venture. According to MedSignal's CEO/innovator, the reasons for the slow growth process have been the entrepreneurial attitude and reluctance to welcome external investments:

> *"We have made everything with time, so to speak, I mean in the long term with small investments. So, it has largely been learning-by-doing, a bit too much even."*
>
> *"But last year we have concentrated a lot on the launch of new products, and I have a feeling that we are now truly in a growth phase although we are an old company. This must have also been a funny situation for some of the funders since they often concentrate only on start-ups, but as an experienced company finds a new stage … we also have actual experience and perceptions from abroad."* (CEO/innovator, MedSignal 2014)

Although MedSignal has a considerable company history, the growth takes place in cycles, as reflected in the CEO/innovator's comments that the company has moved from one product category to another.

4.4.1 Critical events in MedSignal's entrepreneurial internationalisation process

After 20 years of operation, the CEO/innovator of MedSignal decided to buy the business back from investors to regain entrepreneurship. This MBO gave a clear mental re-start to the company, and a new era of business began as innovations were at the same time heading in the desired direction. For this reason, the critical event of company revival sets the reference time in MedSignal's case.

In contrast to all the other case examples, MedSignal has committed to seeking growth from the international market since the early-1990s. It has

therefore already passed the pre-internationalisation activities, but MedSignal is still in an interesting phase as it finds itself in a new growth stage because of the transformation from one product category to another. The current international commitment state is calculated from the time the company started to invest in internationalisation and exports in earnest. MedSignal had already operated in international markets some eight years before it made a decision to commit. This decision in the early 1990s pushed the company forward, and was indicated in 2005 by the CEO/innovator as he described the different eras of company history:

> *"…I can say that we had two phases: from that time we only started exports and serious products. Until then, it* [running a business] *was almost like a hobby."*

Altogether, the investigation period covered 15 years of company history that included at the technology resource-level development and commercialisation of the company's third and fourth product lines (Figure 18). Market launches of these innovations have been important events in MedSignal's lifecycle as they brought the company closer to its original innovation visions, and allowed it to move to a new, vibrant growth state.

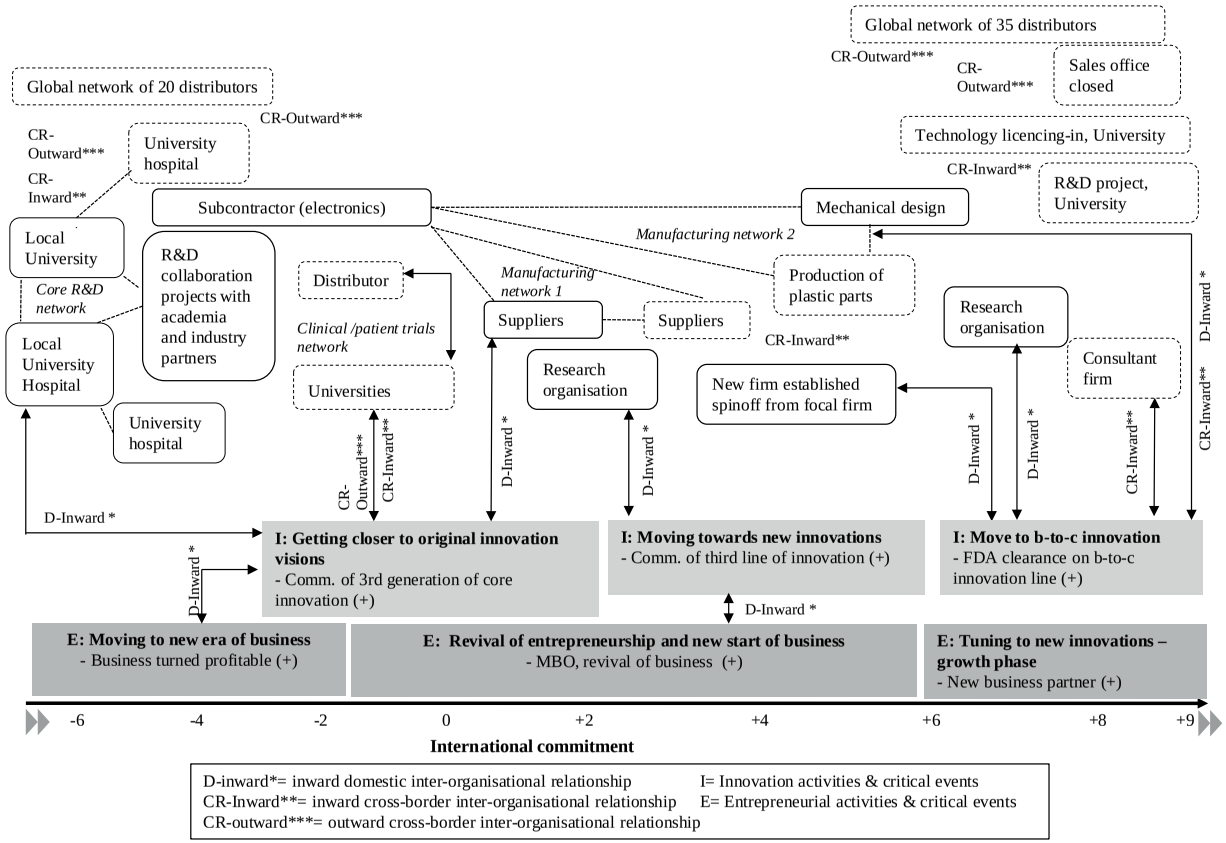

Figure 18 The visual map of events and inter-organisational relationships of MedSignal

It so happened that the company started with the most difficult technological solution of all its innovations, which challenged the innovation development processes and made MedSignal adjust their innovation to seek available solutions at the time. This dilemma of seeking the best technological solutions remains a challenge in many growth-oriented innovative companies, as was explained by the CEO/innovator of MedSignal in 2005:

> *"We need always to operate with restricted resources also financial; therefore, how should I say this, you cannot say this to the customer, but we cannot always make the best possible solutions although we know how those are made, solutions are just too expensive. But you have to make those solutions so that there is room for improvement, to develop further. And that is dependent on the size of crew. But there you have a challenge for real…."*

At the same time, with a new, improved innovation, entrepreneurial resources were reshuffled to prepare the company for this transformation. Given that MedSignal had already passed the internal resource-demanding venture-creation phase, it was able to obtain external resources through more investment-intensive arrangements, such as acquisition and co-ownerships. For instance, three years after the MBO, MedSignal set up a subsidiary and spun out a company in related business with which it continues to have tight R&D collaboration relations. All MedSignal's investments have been in local companies.

Critical events in the near history relate to the development and launch of the new product line that opened a new market for MedSignal. The commercialisation took place seven years after the MBO. It has not only opened new markets, but it has also steered internal focus to service concepts.

> *"I have a feeling that, if only we grow older, only now we are ripe. For real, now we are e.g. developing a service model for our solution. We don't only think about products anymore but also services."* (CEO/innovator, MedSignal 2014)

The FDA approval of the new innovation in the following year created a series of positive occurrences with which MedSignal is, at the time of writing dealing. The novelty of the device raised immediate attention in the US market and elsewhere that resulted in collaboration contacts from many large multinationals, but also raised interest amongst domestic investors. Simultaneously with positive occurrences on the innovation process side, MedSignal obtained a new business partner who brought in entrepreneurial experience and new visions for future growth. To achieve growth often requires focusing on product categories, as a small firm's resources are limited to keep all products in-house.

> *"Looking in the future boldly. If we can rock the world with new things, are we actually able to find a bold gear to our business without damaging the company's finance?"* (CEO/innovator, MedSignal 2014)

Yet, like the above quotation illustrates, courage and motivation are also needed in growing the business. In some cases, these qualities are more difficult to obtain than one expects.

4.4.2 Forming of inter-organisational relationships in international commitment state

Given MedSignal's respectful company history, bulk of routines and experience from innovation development, international markets and venture creation accrued even before the period of investigation. Like any other science- and technology-oriented company in the life science sector, MedSignal's core R&D partners are universities and university hospitals. Due to its long 30 years of experience in the field, it has assembled strong international collaboration partnerships since universities also make up the largest customer group for the company's products. Products are used, for instance, in training and education. This creates important inward and outward links to academia around the world.

> *"We won an important tender to German university, we beat two American and one German competitor. These research organisations are absolutely important in our field; otherwise, we don't get publications, references and validation."* (CEO/innovator, MedSignal 2014)

Universities provide critical external resources for patient studies and scientific publications, and a worldwide patient trial network assists the company to perform these tests efficiently. MedSignal has maintained strategic partnership with some of the partners over the years, for example in the United States.

MedSignal has also been active in participating in R&D collaboration projects with academic and industry partners, both domestic and abroad, that offer access to intangible resources, such as the latest scientific knowledge or potential future customers (e.g. training of students). With domestic research actors, MedSignal designs and initiates projects, brings in its own foreign partnerships, participates in the steering group and sponsors research projects. It actively seeks and is invited to participate in collaborative research, which it has learned to utilise as backup resources. Ideally public-funded research projects act as springboards to start new R&D projects which small firms with limited resources would otherwise have difficulties to initiate. MedSignal's

method of operation is to try to get devices into projects for test use, which raises interest among the lead users and is at the same time an efficient marketing channel. Yet, collaborative relationships take time to form, and challenges are unavoidable, even for a company with an established name and reputation.

> *"Although I said that it has been long, sweaty road, a lot of research contacts have been created. We have learned to operate both in good and bad with researchers. Wishes are sometimes like asking for the moon, but once in a while, we try to fulfil these wishes."* (CEO/innovator, MedSignal 2014)

In addition to academia, MedSignal collaborates in R&D with private companies and has experience both abroad and at home. For example, a few domestic competitors have MedSignal's licenced technology incorporated into their products.

MedSignal has two trusted local subcontracting partners in manufacturing who coordinate production processes, but the whole production system includes various domestic and foreign suppliers as well. The strategic partners are located in the vicinity. One of them is an electronics company that MedSignal had an ownership until the late 2000s; despite the exit, the two companies have maintained collaboration. In the prototyping phase, location is an important factor for efficient communication and faster processes than if the company would use foreign subcontractors. The use of external resources in manufacturing is often unavoidable, but finding a trusted partner to manage the production is essential.

> *"…local mechanics designer who has firm experience from Hungary, Malaysia and China. He has made the design and then the plastic parts were produced in China, but he went there for two weeks to supervise the end quality. And took care of it … nothing would have happened otherwise, several small mistakes were avoided."* (CEO/innovator, MedSignal 2014)

As in the life science sector at large, sales are managed via distributors who are found commonly in medical fairs to which MedSignal also regularly attends. In addition to agents and distributors, MedSignal had a one-man sales office in Europe, but the office was closed down in the early 2010s because it was not cost-efficient. Medical fairs are important for building credibility, especially in the early venture lifecycle. After 30 years, MedSignal's distribution network reaches all the continents; however, finding the proper distributors is sometimes challenging even for an experienced company.

> *"And then to find agents of suitable size, to whom our product could be a significant source of income is one of the central questions. To get a network of agents who would grow along the company so that*

> *they are able to grow their sales organisations at the same time."* (CEO/innovator, MedSignal 2005)

Large, multinational companies as distribution channels were not that attractive back in 2005 because smaller distributors were preferred. However, the latest consumer innovations MedSignal has launched require the company to find new external resources in commercialisation, and the organisation is inevitably back in discussions with large service providers, especially in large market areas.

4.4.3 Inward–outward links

MedSignal is an example of an experienced entrepreneurial company that uses relationships to meet both tangible and intangible needs. Table 14 illustrates the different inward and outward links in the inter-organisational relationships of MedSignal.

Table 14 The observed inter-organisational relationships in MedSignal

Case	Function / Type	R&D	Venture creation	Manufacturing	Commercialisation
MedSignal	D-inward*	Tangible; Intangible (R&D projects, education); Intangible/ tangible (university hospital, host organisation)	Intangible (new business partner); Tangible (finance)	Tangible; Intangible/ tangible (location, help from local designer/ manufacturer)	-
	CR-inward **	Tangible; Intangible/ tangible (intense collaboration with some universities); Intangible (competitor collaboration)	-	Tangible	Intangible (gaining credibility)
	CR-outward ***	Intangible/ tangible (R&D & sales)	-		Tangible; Intangible/ tangible (sales to R&D partners)
	CR-inward-outward ****	Intangible/ tangible (R&D partners & sales)	-	-	-

D=Domestic, CR=Cross-border

Inter-organisational relationships do not stay constant, and in some cases these intensify in trust so that both tangible and intangible resource needs are satisfied while allowing both inward and outward links to accrue. This is also indicated by the fact that many of the inter-organisational relationships are long-lasting, as MedSignal's manufacturing relations show. Due to the companies' long mutual histories, these relations incorporate room for growth and change. Yet, some relationships have by definition stricter boundaries, such as with funding agencies, and seldom include informal characteristics. 'Long-lasting' is, however, a bit overstated in the context of new ventures, but the early and tight relations to academic organisations and the drive to create inter-organisational relationships to fulfil both tangible and intangible resource needs are indications of wishes to build satisfying longer-term relations. For instance, MedSignal has many lasting inter-organisational R&D relationships, and is able to exploit these relations creatively, mainly for creating customer relations. Yet, given the company's history, the need for external resources for

the venture creation function was not high in the period investigated. The situation differs for a starting company that also needs guidance in setting up the business.

4.5 MedLife

The first ideas that eventually led to the invention emerged from work in the health care sector as well as a hobby that made the entrepreneur/innovator devise a solution to a practical problem encountered at work in the late 1980s. MedLife's invention is a novel system that contains a device but also a training component. Training users and customers is an integral part of the forthcoming innovation as it offers a new method of treating patients. Given that similar products are not on the market and the invention offers a novel method, it is a radical new market-creating invention. Besides being novel, the roots of MedLife's invention are based on a clear market need that makes it demand-based. The idea took some 15 years to mature, and after various contingencies development started in the early 2000s. Regardless of the recognised market opportunity, the final product has not yet, at the time of writing, reached the market but is expected to be commercialised soon.

The invention belongs to the class I medical device category, which means that heavy clinical trials are not required but patient studies are in practise necessary to indicate the efficacy of the device. MedLife's forthcoming innovation will be offered to hospitals which, depending on the size of the hospital, demand only a few devices; therefore, the domestic market will be saturated quickly, requiring MedLife to pursue international growth from the beginning.

> *"…already in the ideation phase, we had know-how and knowledge of the international use, so it was obvious that we aim to global sales. Also to developing countries and emerging economies."* (CEO, MedLife)

Operations to commercialise the invention began around 2010, when the inventor's existing company, established 10 years earlier, changed its name to describe the current invention. At the time, MedLife also received an external management team; a CEO was encountered via the inventor's social network and a few other core members of management joined the company as well. The entrepreneur/innovator had a professional education in health care and had worked on the home front and abroad. The entrepreneur/innovator also held two marketing degrees and had over 10 years of working experience in marketing prior to re-starting the company. The other management team members held either specialised health care or business education.

MedLife employed fewer than 10 employees at the time of the interview, and operated in the medical and therapeutic devices and services sector. Its inter-organisational relationships were largely domestic, but some collaboration with foreign partners has also taken place. Proactive sales efforts have created international demand, and MedLife has already formed an agreement with foreign distributors anxiously waiting for the company to finalise the invention and launch it on the market.

4.5.1 Critical events in MedLife's entrepreneurial internationalisation process

The total observed history of MedLife spans 10 years. The reference time is set at the start of commercialisation activities when the first public funding was received, and the first prototype was soon to be finalised. Development commenced five years before the actual business operations to commercialise the invention were taken forward. The initial development was done mostly by the inventor alone, but the innovation process speeded up as the inventor returned to an old profession after years of working in another field.

> *"I finished my degree, so I had some free time in the evenings and I started to think if something could be done. … we visited domestic companies and they didn't realise any potential in this idea. So I thought that 'ok, maybe I have then to take this forward myself'. Soon, it was time to apply for grants, and we got the first public funding, and I got* [current CEO] *involved because a business plan was needed. I wouldn't have managed without N.N. and N.N* [the core management team members]*."* (Entrepreneur/innovator, MedLife)

A major critical event in the start of MedLife's business resulted from the decision to revive an entrepreneur/innovator's dormant company instead of establishing a new venture (see Figure 19 for critical events and relationships of the company). MedLife was, at the time of revival, rejected from an early stage public funding because of the company's long registered history. Funding was aimed only to new ventures. Luckily, MedLife had already received funding for R&D a year earlier, so that it could finish the prototype and start the patient studies.

Patient studies in a domestic hospital were started one year after the working prototype was finished. The safety of the device was soon assured, but to MedLife's disappointment the usability of the device required further improvements that prolonged the patient studies and postponed commercialisation. These patient studies took longer than foreseen; since the study was initiated and performed entirely by an external hospital partner, MedLife could not intervene to hasten the patient trials. Later patient studies were extended

also to a hospital in a neighbouring country, and to a hospital in the US five years after the reference time. In addition, several locations abroad are waiting to start patient trials with an improved version of the invention at the time of writing.

In the meantime, the invention received recognition at the European level that, to the frustration of MedLife, occurred at precisely the wrong time due to the unfinished innovation process. A lot of interest was raised, and several hospitals tested the device, but MedLife could not yet close any sales as the invention was still undergoing improvements.

> *"It raises interest* [currently], *but unluckily, since we already know that the potential customer will not be that excited … device does not move as it should. So it* [recognition] *came unfortunately too early."* (CEO, MedLife)

The company could not exploit this visibility in the commercialisation the way it wanted. Despite all these challenges in the innovation process and prolonged sales, MedLife has been able to close an important foreign retail partnership deal, although it is waiting to finalise the improvements and get the invention on the market.

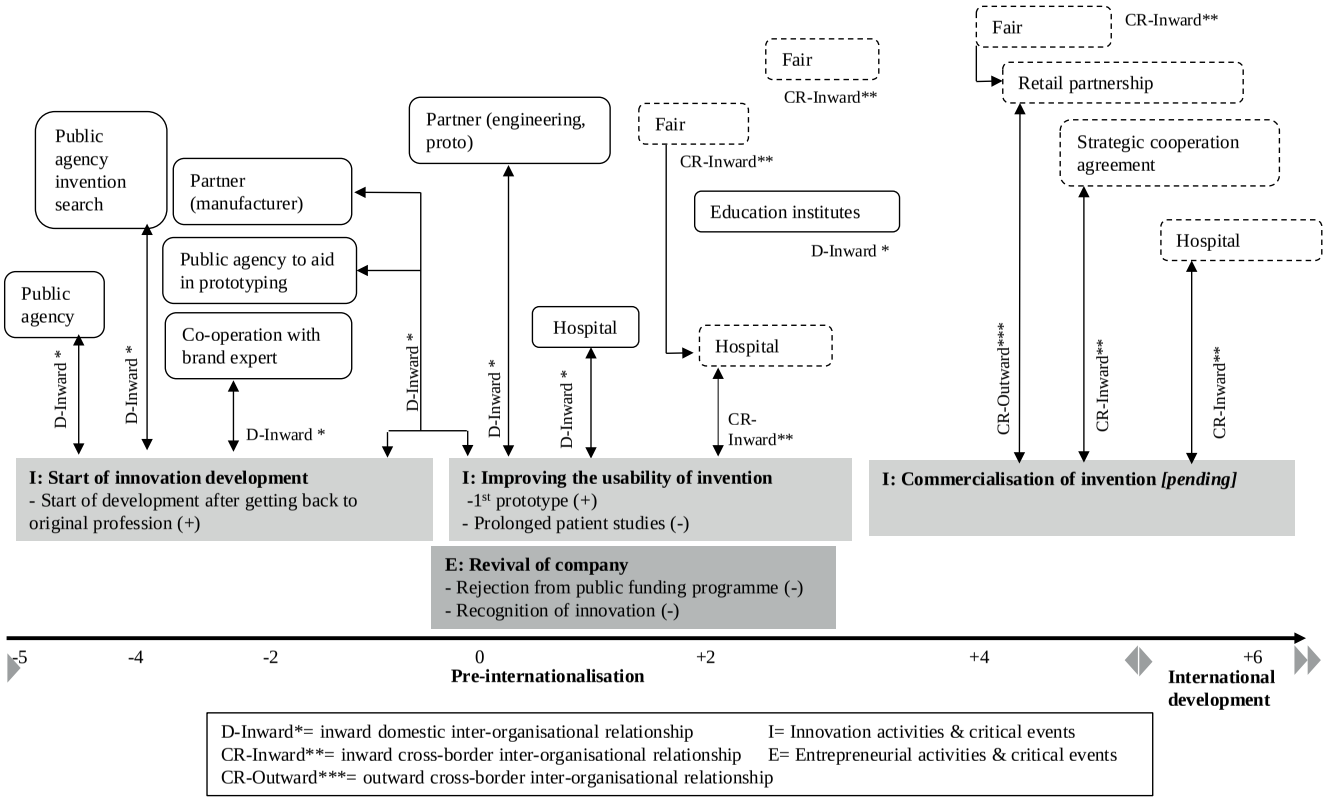

Figure 19 The visual map of events and inter-organisational relationships of MedLife

4.5.2 Forming of inter-organisational relationships in pre-internationalisation and development states

The pre-internationalisation in MedLife lasted altogether 11 years, of which the first five years took place before the business was initiated (Figure 19). Pre-internationalisation ended in the first cross-border retail partnership agreement five years from the reference time.

In the beginning, the inventor received assistance from several domestic public organisations to initiate the innovation development. For an inventor not coming from a technical or science environment, the external help in this regard was highly valuable. In addition, MedLife's inventor was lucky to meet respected people who believed in the idea and helped with matters such as fundraising.

> *"I received a grant for invention and prototype building, but I also received support. I had a project manager who e.g. taught me to hush when talking about the invention. So I learnt various issues that were not very typical for me. Luckily I had a degree in marketing so I could see the potential of the idea."* (Entrepreneur/innovator, MedLife)

Inventing is not without costs; in addition to the external advice and support, financial resources are needed.

> *"I had several jobs in the beginning to pay back the costs accrued from inventing. Some salary had to be earned to pay the costs; luckily public support helped there."* (Entrepreneur/innovator, MedLife)

Since the company has no relations to the academic world in R&D, MedLife has built relations with the domestic engineering firm with whom they developed the prototype, and they have used for instance a brand expert for designing.

Given that patient trials and usability studies have been organised by external partners, collecting user experiences can take easily up to two years. MedLife has offered the invention for test use for several, mainly domestic, hospitals, and official patient trials are being performed in a leading domestic hospital as well. The pilot customers provide information not only for proof of concept and safety, but they also offer crucial information for innovation development that the company must gain promptly in order to proceed in the innovation process. Similar to many radical life science innovations, MedLife's invention demands that users unlearn existing medical practices. This necessity has caused MedLife to work with future health care professionals, at the moment domestic students, to educate them about alternative treatment methods. By intervening at the early stage, MedLife hopes to reduce

training needs in the future. For this reason, MedLife targets sales to foreign markets with a private health care culture, and to new hospitals in which strong practices have not yet accrued.

Training health care professionals and end-users to use the device is one important but resource-demanding component of MedLife's invention. External part-time resources are sometimes needed, and an ideal situation for the company would be to find sales resources that are able to train abroad, i.e. professionals who know the health care practices in the target country.

In addition to external resources in innovation development, MedLife has set up a management advisory board with domestic and international experts to provide external knowledge sources, for instance for international growth. The advisory board is also seen to bring credibility in starting the venture.

> *"Due to my background as a university researcher, we have been able to get these experienced people for advisors. We hope to exploit more of this, but it requires that we get the growth activated and funding organised properly. So far, we have moved in kind of a networked manner."* (CEO, MedLife)

The novelty of the forthcoming innovation is well-observed in the demand it creates in targeted fairs which MedLife selects carefully but attends regularly.

> *"Our stand attracted a lot of people. Everyone wanted to see the innovation, and we received invitations to hospitals. We did not though have readiness at that stage but what was good, the distributors also saw that we have interested people."* (CEO, MedLife)

Contacts to pilot customers and lead users are created in fairs. At the time of writing, MedLife must balance between creating demand and finalising the invention to be commercialised.

4.5.3 Inward–outward links

MedLife has created inward links with domestic partners since the beginning of its invention development, and it has been able to utilise these inter-organisational relationships for both intangible and tangible resource needs (Table 15). However, because of the company's unfinished innovation process, the combined inward–outward links were not yet visible in the data.

Table 15 The observed inter-organisational relationships in MedLife

Case	Function / Type	R&D	Venture creation	Manufacturing	Commercialisation
MedLife	D-inward*	Tangible; Intangible (informal advice in the start of innovation development); Intangible/ tangible (advice & prototyping)	Intangible (guidance to prepare finance application); Tangible	Tangible	Intangible (education sector training)
	CR-inward **	Tangible	Tangible; Intangible (gained credibility from senior comments)	-	Tangible; Intangible/ tangible (conference & invitation to visit potential customer); Intangible (contacts)
	CR-outward ***	-	-	-	Tangible; Intangible/ tangible (conference leads to patient studies in hospitals)

D=Domestic, CR=Cross-border

Given that sales and distribution in life science companies commonly take place via distributor networks, to find agents and distributors are the main activities in commercialisation. Contacts take place in fairs and other events, but since customer segments are highly specialised and lead users difficult to reach, companies need to exert effort in scientific marketing early in their innovation processes to create demand for the innovation and to utilise inter-organisational relationships creatively. This can be seen in MedLife: although it has not yet commercialised its invention, it is actively forming inter-organisational relationships for commercialisation and using these relations to find resources for patient studies. In the health care sector, especially with public customers, sales processes are long and unstable because of the hierarchical systems that encumber small companies' restricted resources. For this reason, personal sales are an important but resource-demanding channel as specialised sales personnel are required.

4.6 Commonalities among cases

A common feature for all the case companies is that they serve global niche markets with their radically new innovations, or they are envisaged to serve such markets when their inventions reach commercialisation (MedHeart and

MedLife). For radical innovations, the market has to be created regardless of the technology or market origin. Demand-based innovations have an existing market, which pushes companies, for instance, to work with the education sector to train the future professionals. In addition, the life science sector is quite conventional, which means that, in order to introduce new treatment methods, the old habits of physicians and other health care professionals must be unlearned. Credibility and reputation among the lead users are challenging to gain, too. Most of the case companies operate in a business-to-business market, in which their main customer is the hospital. Therefore, sales processes take a relatively long time to complete.

Table 16 summarises the pre-entry resources and entrant types of the cases. Each case is a new (de novo) entrant in the business, but most of the cases are university spin-offs which carry some external resources from academia. For a de novo start-up, these relations to academia do not often exist, but their knowledge resources are compensated with business experience; hence, these companies might possess better knowledge of market needs at the time of entry.

Table 16 Summary of the resources at venture creation

Case	Invention/Innovation type	Entrant type	Knowledge resources at the time of venture creation
MedHeart	Radical, new-to-global market. Technology origin.	De novo entrant – university spin-off	Founding team: only technical
MedImage	Radical, new-to-global market. Market origin.	De novo entrant – university spin-off	Founding team: technical and business (education)
MedBio	Radical, new-to-global market. Technology (*)/market origin.	De novo entrant – entrepreneurial spin-off, management buy-out	Founder: technical and business
MedSignal	Radical, new-to-global market. Technology (*)/market origin.	De novo entrant – university spin-off	Founder: technical
MedLife	Radical, new-to-global market. Market origin.	De novo entrant – start-up	Founding team: business education and experience, technical experience

(*) Original innovation

A second interesting issue that arose from the case analysis, although not in the direct focus of the study, was related to the entrepreneurs' attitude towards growth. Although high-growth aspirations are often associated to radical innovation-developing companies (Gilbert et al. 2006; Brännback et al. 2007), the data showed that, while growth – and international growth in particular – was in the entrepreneurs' sights, high growth was often challenging to obtain and not desirable, even in the most innovative companies. Strong technological capability leads to organic growth as often these companies concentrate on frequent product upgrades and launch new product lines to accrue income (Zahra et al. 2006). In addition, previous studies have shown that incremental growth in life science business creates sustainable international business (Lindstrand et al. 2011; Melén Hånell et al. 2014). This argument is based on the gradual learning and knowledge development of foreign markets as suggested by behavioural internationalisation models (e.g. Johanson & Vahlne 1977). The present data exhibits the same phenomenon; for instance, MedImage and MedSignal have both relied on the organic internal growth strategy, and prefer to grow slowly (see summary of the cases in Table 17).

Table 17 Summary of attitude towards international growth in the cases

Case	Attitude towards international growth
MedHeart	Proactive*
MedImage	Organic growth
MedBio	High, rapid growth
MedSignal	Organic growth
MedLife	Proactive*

*Innovation not yet on market. Venture capital favourable.

In an innovation- and science-driven company, too much concentration on inventions and technologies might lead to a pitfall as growth is challenging to achieve without focusing on the innovation portfolio. Similar indications have been made in the growth literature, pointing out that the product expansion strategy is likely to lead to slower growth (Mishina et al. 2004). Growth is also demanding to manage, as pondered by the CEO/innovator of MedSignal:

> *"Someone judged before the MBO that we had spent too much on R&D. For one summer, I had a major distress about this, but I concluded that we have invested too little in R&D instead. If we had made more finished products and had courage to put more effort in, we would have been able to get the company quicker to shape, so that it grows. Products were too prototype alike what we had to sell, too unfinished. This actually created the lag."*
>
> *"What obstructed us then?... Often happens, to a company like ours, that company encapsulates, we become eternal maggots who remain captured to their own smallness."* (CEO/innovator, MedSignal)

These quotes illustrate that growth demands courage, which in turn demands experience and capabilities that new ventures might not possess in the beginning but are capable to obtain over time. As pointed out in the previous literature, early growth might be dangerous if the firm lacks resource reserves (Garnsey et al. 2006) or lacks the capability to use external resources. Uncontrolled early growth is likely to lead to growth challenges (Chetty & Campbell-Hunt 2003; Garnsey et al. 2006; Penrose 2009).

At the other end of the spectrum are companies that seek rapid international growth, like MedBio in the present data. It has employed an aggressive approach to internationalisation and has been able to grow its global sales network rapidly. Its strategy was to create the global sales network first and feed new innovations to this network. Its advantage in pursuing this growth

strategy was that it adopted a basic innovation that was ready during the MBO, whereas, in the other case companies, novel innovations were fully developed in-house and did not have ready-made markets. Other case companies have also maintained a proactive risk-taking attitude to internationalisation that was observable in their search for distant market areas since the beginning of their internationalisation. For instance, MedImage's CEO/founder noted they had encountered a small, unexpectedly good result in the Asian market, and MedLife's first distribution agreement was to the Middle East.

The motivation for international growth defines the cognitive boundaries of innovative entrepreneurial firms and the mental models of entrepreneurs (Mitchell et al. 2002; Autio et al. 2011) that affect the paths companies are to follow and the opportunities they pursue in entrepreneurial internationalisation. Entrepreneurs have to take the decision to grow (Gilbert et al. 2006; Knockaert et al. 2015), but the mental models are fairly persistent, as the example of MedSignal suggests.

> "*An investor* [name retrieved] *contacted us to inquire if we happened to need any funding. They noticed us after FDA, which is remarkable as we are an old company. I said to them that 'I haven't ever thought of you' and now they basically let us decide whether we want them in or not. I said that of course we need investors but we'll think how and what are the conditions and valuation, but we definitely don't need any investors with bad valuation*." (CEO/innovator, MedSignal)

Third, resource-seeking in the case companies varied mainly because of the differences in the companies' lifecycles. Still, they exhibited many similarities in behaviour regardless of the age and experience of the companies. The case examples indicate that the tightest inter-organisational relationships are formed with domestic partners, often from a close geographical vicinity. These relationships are classified as the inward domestic-type. Table 18 offers a summary of the different observed inter-organisational relationships categorised by their function and the type of link they offer (inward–outward) in the entrepreneurial internationalisation process. As previously mentioned, inward relationships bring in external resources for the company's strategic processes, while outward relationships are intended to exploit companies' internal resources, mainly to commercialise an invention. Only a few cases exhibited outward links related to matters other than commercialisation (e.g. licencing out) due to the nature of ventures whose resources are largely tied to internal processes at the beginning of the company's life.

Table 18 Summary of different kinds of inter-organisational relationships observed in the cases

Case	Function / Type	**R&D**	**Venture creation**	**Manufactu-ring**	**Commerciali-sation**
MedHeart	D-inward*	T; T/I	T/I; T	-	-
	CR-inward**	T/I; T	T; T/I	T/I	T/I
	CR-outward***	T	-	-	-
	CR-inward-outward****	-	-	-	-
MedImage	D-inward*	T	I	T	-
	CR-inward**	T	-	T/I	I
	CR-outward***	-	-	-	T
	CR-inward-outward****	T/I	-	-	-
MedBio	D-inward*	T; T/I	-	T	-
	CR-inward**	I; T	-	T	T/I
	CR-outward***	-	-	-	T; I
	CR-inward-outward****	-	-	-	-
MedSignal	D-inward*	T; I; T/I	I; T	T; T/I	-
	CR-inward**	T; T/I	-	T	I
	CR-outward***	T/I	-	-	T; T/I
	CR-inward-outward****	T/I	-	-	-
MedLife	D-inward*	T; I; T/I	I; T	T	I
	CR-inward**	T	T; I	-	T; T/I; I
	CR-outward***	-	-	-	T; T/I
	CR-inward-outward****	-	-	-	-
CR = cross-border, D = domestic		T = tangible; I = intangible, T/I = tangible/intangible - = not observed in case			

If assessed by relationship types, strong domestic inward relationships were seen in R&D and manufacturing as well as in activities related to the business or venture creation. In contrast, domestic commercialisation-related inter-organisational relationships did not occur because commercial activities in these international new ventures are by definition international. The case companies also extensively exploited cross-border inward relationships (Table 18); however, although the number of partners was not high in the pre-interna-

tionalisation, many of the case companies were able to create significant foreign connections in the early stages of company life. It was further observed that cross-border inward links were often the first links in internationalisation, as found in other studies, such as Jones (1999; 2001).

In some case companies, specific inward-outward relationships in the cross-border context were observed. These relationships were purposefully initiated to serve a dual purpose; for instance, companies formed strategic partnerships with foreign companies to distribute innovations and collaborate in R&D. In the inward-outward internationalisation, these kinds of relationships were the most influential (Welch & Luostarinen 1993; Korhonen et al. 1996). However, during pre-internationalisation, the company might not have been able to determine which of the inter-organisational relationships were essential (Söderqvist & Chetty 2013). For starting ventures, inward-outward relationships are important alliances, especially in large market areas, to get user experiences and accelerate the certification of an innovation for market entry. However, these alliances often take time to materialise as new innovative companies must first gain credibility. For this reason, the experienced companies might have better competences to utilise these kinds of strategic inward-outward relationships, but this comment from the CEO/innovator of MedHeart reveals that these relations are seen as ideal:

> *"A controlled trial is not for earning, it's for paying. … in such a study, you have maybe five to six other centres and, maybe they remain your customers after the controlled trial."*

Furthermore, the findings clearly reveal that the largest external resource needs in starting ventures are in research and development (Table 18), which means that many companies have formed tight relationships with local universities and university hospitals whose assistance is needed especially in clinical and patient trials. With time, relationships with academic partners transform to meet the missing tangible resource need (inward link), but they might incorporate an outward component, too. For instance, a foreign university can act as a partner in clinical trials but also be a customer for the company's products. This situation is evident in MedSignal's case, as MedSignal had already advanced in its entrepreneurial internationalisation process and was able to use its inter-organisational relationships for multiple purposes.

In the light of cases analysed, business- and entrepreneur-related inter-organisational relationships were significant is some cases and completely absent in others, which might have to do with the backgrounds of the entrepreneurs and their human capital prior to starting the venture (Melén & Rovira Nordman 2007). Inventors that are setting up their business without previous entrepreneurial experience must gain formal and informal assistance, like motivation. They may also feel they have gained a lot from public

agencies assisting start-ups, whereas experienced companies use public services less. These findings support the results of a previous study by Melén and Rovira Nordman (2007), which showed that, in life science, both personal and business networks are important in internationalisation, but the importance of various relationships differs at different states of internationalisation. It is observed that relationships are stronger, but also ambiguous, in the venture-creation phase (Söderqvist & Chetty 2013). Relying too heavily on personal relationships can be detrimental to progress in internationalisation.

5 JOURNEY FROM INNOVATION TO ENTREPRENEURIAL INTERNATIONALISATION

5.1 Inward–outward links in entrepreneurial internationalisation

The decision to develop an innovation for the global market is taken early in the entrepreneurial internationalisation process, namely in pre-internationalisation when the innovation development begins. As a result, connections to foreign users and customers start to accrue. In technology-intensive companies, this requires the adaptation to foreign innovation sources and markets early in the venture's life, even before the incorporation of the company. The entrepreneurial internationalisation processes and identified states in the case investigation are summarised in Figure 20. In all cases except one, pre-internationalisation was placed in the observed period. MedSignal has a significant company history and international operations that suggest it has already committed to entrepreneurial internationalisation. In some cases, pre-internationalisation ended at the reference time (time 0) in the process investigation, but in two cases, it continued longer because of unfinished innovation processes.

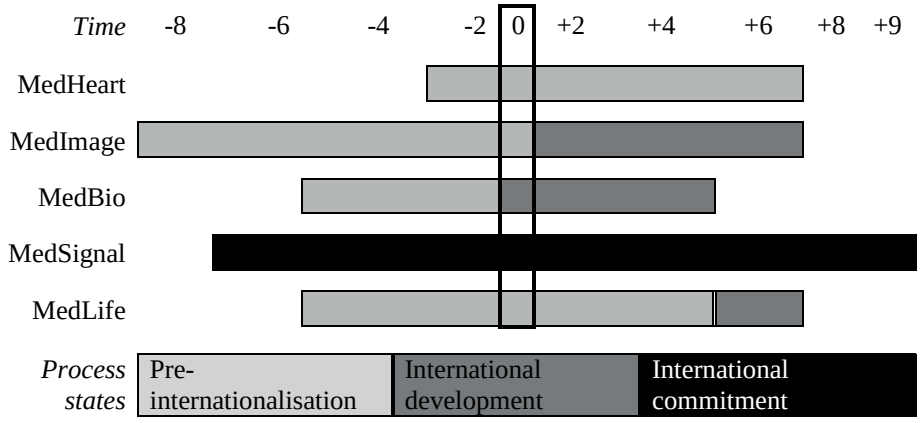

Figure 20 Entrepreneurial internationalisation processes of the cases

Although the comparison of the durations of pre-internationalisation as such is not meaningful because of the dissimilarity of cases and the proposed recurrence of states in entrepreneurial internationalisation, taking a closer look at this early period of innovative companies is worthwhile. This study argues that pre-internationalisation might take place only once in entrepreneurial internationalisation if the company continues to innovate within the same technology boundaries. First, it can be observed that this period is fairly long in the studied companies (Figure 20). The cases indicate that pre-internationalisation takes about 10 years in de novo companies who develop their technological innovation internally; as such, this is a significant period for starting companies. MedBio's case differed because they purchased technology that was already on the market; therefore, the length of their pre-internationalisation is not directly comparable to other cases. In addition, MedHeart's innovation process is still on-going; at the time of writing, the company has experienced nine years of pre-internationalisation and is likely to accumulate a few more years before the invention reaches international sales. As the case of MedHeart indicates, class III life science products incorporate a longer innovation process due to the requirements for clinical trials.

Another noteworthy matter is that pre-internationalisation begins well prior to a company's incorporation when the commencement is calculated from the beginning of innovation development. This period would be even longer if calculated from the origin of the innovation; that is, the time when the idea for the innovation is first expressed, which is the actual critical point to launch an innovation development process. It could be that an innovation idea originates from an offshore demand, experience, or science which, by nature, is global; if so, an international dimension to the innovation process is integrated from the start. The origins of high-technology innovations often have in one way or another cross-border resources involved, either indirectly or directly. Therefore, it is evident that pre-internationalisation incorporates a lengthy period of innovation development before companies start the actual business operations to commercialise the invention. From the resource-seeking perspective, this period has the potential to include critical events and/or activities that influence the future journey of entrepreneurial internationalisation.

The first interesting question to examine is: what kinds of inter-organisational relationship links do companies create to the entrepreneurial internationalisation process in pre-internationalisation? Pre-internationalisation incorporates mainly activities related to the development and pre-commercialisation of the invention. As such, most of the R&D and manufacturing resource needs occur during pre-internationalisation, and companies concentrate on creating mostly cross-border inward links at this state in order

to access complementing resources. Table 19 offers a summary of the cross-border inter-organisational relationships case companies engaged in during pre-internationalisation as well as the types of resources they sought. The cross-border outward link created in MedHeart was an attempt to sell the core technology to a German company, which happened at the beginning of pre-internationalisation before the company then decided to take the technology forward itself. In MedBio's case, the existing foreign sales channels for innovation created the outward cross-border links.

Table 19 Summary of the cases: cross-border inward links in pre-internationalisation

Case	Cross-border inward links	Cross-border outward links	Cross-border inward-outward links
MedHeart	Yes. Manufacturing and financial resources.	Yes. R&D resource.	No
MedImage	Yes. Research, manufacturing and Intellectual Property (IP) resources.	No	No
MedBio	Yes. Research resources, outsourcing development, and outsourcing manufacturing.	Yes. Sales resources.	Yes. Inward R&D and outward sale resources.
MedSignal	n/a	n/a	n/a
MedLife	Yes. Development (clinical trial) and sales resources.	No	No

Some reputation-building activities like contacts to lead users at foreign organisations occurred in pre-internationalisation, but commercialisation-related outward relationships with distributors and attendance in fairs took place mainly during the international development state that followed pre-internationalisation. Reputation-related relationships with lead users and institutions are important in entrepreneurial internationalisation (Partanen et al. 2008; Tolstoy & Agndal 2010). Due to the long and demanding sales processes in the life science sector, these relationships should be an integral part of pre-internationalisation from the early stages of the innovation development process. Company image and reputation are valuable intangible resources (Grant 1991; Chetty & Wilson 2003).

Given that companies were observed to engage in offshore inter-organisational relationships in pre-internationalisation, the follow-up question is: how do the cross-border inward links connect to outward relationships? The strategic use of inward to enhance outward relationships was not as visible in the cases of younger companies who were creating their ventures and developing the technology for their first innovations. However, a clear link between inward–outward activities was given for instance in the study by Karlsen et al. (2003). In the current study, the case companies expressed a goal to create such inward–outward inter-organisational relationships but, due to their young age, the companies had not accrued the required experience to mature their inter-organisational relationships. Söderqvist and Chetty (2013) proposed similar results in their investigation of the strength of ties. They showed that, at the early stage of international new ventures, entrepreneurs are not able to see the benefits of different relationships and ties hold both strong and weak characteristics. The authors called these as strong as weak ties (Söderqvist & Chetty 2013). Some examples of how the potential inward-outward links were present in pre-internationalisation are given in the following quotes.

> *"It was better that the medical doctors stayed at the clinic, they* [stay to] *their science. And as mentioned, the scientific marketing is very important. Basically the professor is my most valuable sales manager."* (CEO/founder, MedImage)

> *"…in a study, you have maybe five to six other (centres) and, maybe they remain your customer also after controlled trial."* (CEO/innovator, MedHeart)

> *"We have training in education institutes fairly well, and it will lower the training need then, perhaps, in some later stage* [of commercialisation]*."* (CEO, MedLife)

Partanen et al. (2008) suggested that increased social capital helps companies to build relationships, which was seen in the present case data as well. In the older and more experienced companies (MedSignal and MedBio), such inward–outward relationships were more visible because of accumulated relational, structural and cognitive capital, such as diversity, trust and shared cognitive schema in relationships (Partanen et al. 2008). Versatile relationships are difficult to create, and even the experienced players, like MedSignal, who possess a vast cross-border relationship pool are continuously challenged to take more advantage of their relationships. Companies' resource needs change as the entrepreneurial internationalisation process progresses, placing new expectations on inter-organisational relationships. The absence of cross-border inward–outward links in the early stages of venture creation indicates that routine in collaboration is important when seeking external resources, which

in turn highlights the importance of a learning and commitment cycle in resource-seeking internationalisation (cf. Johanson & Vahlne 1977; 2009).

Neglecting pre-internationalisation in assessing internationalisation in new ventures might not give a full picture, as Hewerdine and Welch (2013) have also suggested. Pre-organisational history is important to take into account in studies that address the resource (Hewerdine & Welch 2013; Hewerdine et al. 2014) and capability perspectives (Helfat & Lieberman 2002). Similar to the present study, these studies look at the internationalisation of value-chain activities rather than purely seeking new markets.

The findings have further shown that new innovative ventures begin their internationalisation with cross-border inward links as found in previous studies (e.g. Korhonen 1999; Jones 1999; 2001). Yet, no clear pattern for cross-border resource-seeking was observed, as the case companies engaged in versatile cross-border resources, rather than only one type. Furthermore, inter-organisational relationships were not specifically sought from the cross-border context, but companies sought whichever resources fit them best. For ventures whose invention or innovation originated from science, relationships with foreign R&D partners tended to be the first because of the importance of scientific tangible and intangible resources.

It was observed that most of the international sale contacts were formed after pre-internationalisation as many started in international markets gradually due to resource restrictions. Even in international new ventures internationalisation evolves gradually. Often the first sales are domestic because the local scientific partners also are customers for the innovation, and can serve as pilot customers. However, the market in which these new ventures operate is so small (e.g. hospitals may need only one of a particular device) that ventures have to be prepared to accrue sales from different locations at the same time; therefore, they internationalise rapidly. Yet, systematic building of the sales contacts, reflecting the inward–outward link, was not observed because the companies' resources were tied to their technology and innovation development at the early state of pre-internationalisation in the entrepreneurial internationalisation process.

5.2 Seeking resources in entrepreneurial internationalisation

In the light of open innovation thinking (e.g. Van de Vrande et al. 2009), the small number of overall partners found in the cases was surprising, as the core innovation development is done mainly with internal resources. Although the study revealed a proactive approach to collaboration throughout the whole innovation process and evidence of explorative and exploitative innovation

search (March 1991), the concentration on internal R&D was intriguing. For example, the findings of Renko et al. (2008) from the US biotechnology firms identified that these companies engaged with vast different external sources to interact in the innovation process. These deviating results suggest the presence of industry- and country-specific differences in innovation culture. In this regard, innovators in this study showed incredible motivation and feistiness to pursue technological innovation initially with minimal human, technological and financial resources. It was clearly expected to find, first, more collaborative inter-organisational relationships and, second, more resource generation (i.e. co-development) activities in international growth-seeking, as suggested by Ahokangas (1998) and Chen et al. (2009). Some cross-border strategic partnerships, which in Ahokangas's (1998) model are seen as control type of resources, were observed to emerge in a few cases, but these did not occur in the early stages of venture life. These types of relationships formed after pre-internationalisation, which could be a result of the liability of newness, or the lack of reputation experienced particularly in the pre-internationalisation state.

In addition, in contrast to evidence of general collaborative behaviour in high-technology companies (e.g. Hewerdine et al. 2014), the case companies did not express a preference for relationships with large companies, as these were assessed to be more 'difficult' partners due to the size differences. It was surprising to find that the relationships between small and large companies were absent in the life science field, but that could be a result of the particular group of companies studied. Commonly, partnerships with small and large companies, for instance in getting innovations to market, are seen as prevailing in life science (e.g. Rothaermel & Deeds 2004; Brännback et al. 2007). However, the strong entrepreneurial management attitude observed in the cases or the young age of the companies could be possible reasons for the missing links with large companies. Alternatively, the sectoral differences could be an explanation. Previous studies have shown that collaboration in pharmaceuticals and biotechnology takes a somewhat different pattern than in medical technology (e.g. Kleyn et al. 2007; Renko et al. 2008).

Moreover, given that domestic inter-organisational relationships dominated in the data, those cross-border relationships that ventures created seemed to be within close geographical regions, often from a neighbouring country. This finding indicates that the innovation search scope of beginning companies is fairly narrow, although – as evidence from the more experienced case companies showed – the scope widens in R&D activities with the extension of the company's international sales channels. The core external R&D resources seem to remain local even when other value chain activities become international. Here, social relations with the host organisation keep the company rooted to the local region. As the literature has suggested, too strong

dependence on domestic and local knowledge networks may transform into innovation and knowledge lock-in (e.g. Narula 2002; Boschma 2005) which could hinder the company's ability to innovate accordingly and move forward. Similar concerns have been raised from the life science sector, in which too strong dependence on personal (which could be highly local) networks is not beneficial to the company's internationalisation (Melén & Rovira Nordman 2007). In the case companies, although they had strong domestic resource links, the above negative aspects were not observed. One reason could be that most cases were still in the very early stage of internationalisation and venture creation in general.

Given that sufficiency of financial resources determines the success of a company and is a prominent challenge in each starting venture (e.g. Wessner 2005; Gilbert et al. 2006; Chen et al. 2009), the inter-organisational relationships related to financial resources were not raised as a highly decisive factor in the data. This discrepancy could be a result of two factors: the availability of public funding and the organic growth-oriented motivation of the entrepreneurs. Both Finland and Austria have good public funding schemes in the pre-commercial stage, and all of the case companies had been able to take advantage of these in one form or another. Yet, in the case of MedLife, the lack of financial resources was clearly one of the reasons prolonging invention commercialisation and venture development. MedLife had received public funding, but not the one it needed at the critical time of starting the business operations to bring the invention to market.

The availability of public R&D funding could also have a more negative impact on entrepreneurial internationalisation than is generally perceived. Innovative companies face a deep finance gap when proceeding toward markets, and for an inexperienced entrepreneur, it might come as a surprise when they have been able to enjoy public funding to develop innovation, but those resources are suddenly not as generously available to create the market and demand for the innovation than previously. For this reason, organising resources for commercialisation should be integrated in the earlier stages of the innovation process (building of inward-outward links). A creative way of exploiting inter-organisational relationships could be a part of the solution to overcome the resource gaps in finance that the new ventures face.

The second issue is the strong growth-averse attitude many of the entrepreneurs possessed. Several participants clearly stated that the company preferred a slow and organic growth path, in which learning from experience is placed in the central role. This finding reinforces evidence from earlier studies in life science ventures (Lindstrand et al. 2011). Entrepreneurs had negative attitude towards external investors, mainly towards venture capitalists, but this opinion was based more on general beliefs, for example the fear of losing decision-

making power, than on any actual experience of working with venture capitalists. The preference for organic growth is common in entrepreneur-led companies, as often venture is perceived as a way to fulfil visions and produce innovations (Gilbert et al. 2006; Chen et al. 2009). This view was supported in the cases. However, growth-oriented companies also existed in the data, and these were more open to external financial resources.

Given the resource-seeking strategy in internationalisation (Ahokangas 1998; Di Gregorio et al. 2008; Hewerdine et al. 2014), the findings of the present study show that ventures purposefully sought external resources from the beginning of the innovation process. The nature of resources varies depending on the innovation, namely whether the innovation is technology push or demand pull. Similar arguments have been raised in the literature (e.g. Renko et al. 2008). For science-origin companies, access to tangible R&D resources is more crucial in the inventing, whereas for market-originating innovations intangible resources for testing the ideas might be more important. A common strategy for the creative utilisation of resources, called bricolage (Baker et al. 2003; Baker & Nelson 2005), was not that visible in the present data. Although the bricolage strategy is associated to resource-scarce ventures, a common situation in the case companies, the observed purposeful search for additional external resources did not directly support the bricolage approach. Naturally, some characteristics of bricolage and effectual behaviour (Sarasvathy 2001) were observed in the studied entrepreneurial companies. One reason for the absence of the creative use of internal resources could be the selection of the industry, and the fact that companies are developing and commercialising high-technology products and have clear activities they need to outsource, for example clinical trials or manufacturing. To handle all activities and functions in-house is impossible for a starting high-technology venture.

In lieu of bricolage, case companies engaged in creative but purposeful resource-seeking, an approach that is known as resource scavenging (Hewerdine et al. 2014). According to Hewerdine et al. (2014), resources are used whenever found without following any pre-determined strategy, which is a prominent behaviour for innovative technology-intensive companies. In Ahokangas's (1998) model, this is called resource adjustment, which refers to the creative use of resource-seeking modes for internationalisation. This kind of behaviour was supported in the life science cases as well, specifically in the pre-internationalisation state when the emerging companies were sourcing technological and production resources to progress in innovation development and build their inter-organisational relationships for upcoming activities. But, their behaviour changed to market seeking, that is, extending their customer base to the foreign market, later in entrepreneurial internationalisation. Even

so, the case companies' behaviour resembled the scavenging type of behaviour, except in the case of MedBio, which formulated a solid internationalisation strategy when starting the company. An example of MedLife's sales activities illustrates the scavenging attitude:

> *"When we have attended a fair in specific country, we often have invitations to top hospitals in the country. … We haven't ever been calling to customers."* (CEO, MedLife)

MedLife has not yet finished their innovation development process, which could well be reflected in their current sales behaviour, and of course change is possible when the invention is on the market and the real sales work truly begins. The resource-scavenging phenomenon does not seem to be limited to starting ventures only, since companies with experience in innovation and internationalisation gave indications of scavenging behaviour as well, in R&D especially. Further evidence of scavenging behaviour could be observed in the creative use of intangible and tangible resources in companies. Some of the cross-border relationships turned out to be highly significant to companies' entrepreneurial internationalisation processes as these solved more than one encountered uncertainty. Consequently, resource scavenging seems to relate strongly to the inward–outward approach in internationalisation, given that both have strong dimensions of creativity and flexibility involved although the relationship with resource seeking is not explicitly stated in the early inward–outward literature (see e.g. Luostarinen 1994; Korhonen 1999). The ultimate goal of the inward–outward approach is to turn inward links into outward links in internationalisation. A more recent development in this regard is the strategic resource-based re-structuring in new ventures proposed by Freeman et al. (2013) which emphasises a company's international activities to be altered to continuous change, also in the form of re- and de-internationalisation.

5.3 Identifying capability to collaborate in entrepreneurial internationalisation

Before starting the discussion of the collaboration capability in the entrepreneurial internationalisation process, a few general observations arising from the case data are worth mentioning. First, inter-organisational relationships were seen in a very positive light. There was hardly any complaint about identifying resources and partners, and little complaint about the liabilities of smallness and newness often associated to new ventures (Shelton 2005) to access the resources via inter-organisational partnerships. In addition, experience from inter-organisational partnerships was mostly positive, with undesirable challenging situations emerging in only a few cases. However,

some divergent experiences and attitudes were also observed, of which a negative attitude towards consultants and investors was the most prominent. Discontent towards the latter group of actors could be a result of the organic growth aspiration discussed earlier, whereas frustration at consultants may be a result of the disappointments the companies had experienced in the early phases of company life as well as dissatisfaction with the advice given on how to grow the company quickly. Second, as a reminder of the earlier discussion of results in Section 4.6, inter-organisational relationships are formed to sort out a resource deficit of some sort, meaning that more tangible than intangible or combined relationships were observed. In addition, often relationships are unidirectional than multidirectional, and more experienced companies are able to use a relationship for multiple purposes better than starting ventures.

Building on the earlier phases of data analysis (see Sections 5.1 and 5.2) and the observations above, dimensions of capability to collaborate were constructed from the inter-organisational relationship data. Since data-driven analysis takes multiple steps, the process is briefly explained in Appendix 8, whereas discussion in this section goes directly into presenting the results.

Capabilities form on experience, learning and routines (e.g. Nelson & Winter 1982; Amit & Schoemaker 1993). In the present study, capabilities were identified from the companies' involvement in and strategic aspirations of operating in inter-organisational relationships to seek resources. Figure 21 illustrates the constructed five dimensions of collaboration capability and the data-driven descriptions on which each dimension is based. Compared to existing constructs on networking capability that emphasise more of the ability to manage external relationships (e.g. Walter et al. 2006; McGrath & O'Toole 2013), the collaboration capability identified in this study stresses the ability to interact in inter-organisational relationships venture builds to pursue resource-seeking internationalisation, and highlight active doing. On the basis of the three core activities of deploying external resources (i.e. seeking, cooperating and strategic), five dimensions of collaboration capability were identified that had already started to arise in the previous phases of data analysis.

The main characteristics of collaboration capability, especially in the new growing and internationalising venture, are change and transformation, which are well present in all identified five dimensions. Relationships are not static, and a venture's inter-organisational relationships should be able to meet the challenges/opportunities the venture faces along its internationalisation process. Consequently, transformation is one of the central components of the capability to collaborate. Three out of five dimensions have characteristics of all three core activities important for collaboration, namely seeking resources and transferring resources with partners as well as one slightly wider category of strategy, which emphasises the objectives of getting engaged in collabora-

tion (Figure 21). One should note that, although the division of dimensions looks straightforward in Figure 21, the dimensions are closely interlinked and have similar characteristics.

The first dimension of collaboration capability *"to seek and test different options for building relationships"* refers to a company's ability to select partners and be creative in searching for and building inter-organisational relationships. This aspect has similar characteristics to the scavenging approach (Hewerdine et al. 2014) that builds on the creative use of relationships to rummage resources wherever those are to be found. But, it also emphasises the entrepreneurial ability to be open to opportunities and serendipity (Covin & Miller 2014). The capability to collaborate also requests a more strategic approach since the relationships a starting company is able to participate in simultaneously are few. Besides, as Torkkeli et al. (2015) suggested, the strategic evaluation of partnerships is important for network capability to develop and often this activity might be left aside in starting companies who follow ad-hoc collaboration strategies, for instance. The next dimension, *"to create relationships to meet both tangible and intangible needs"*, characterises the strategic use of existing and future relationships to meet the tangible and intangible resource needs of the company. Companies are to continuously evaluate their resource needs and to collect and use information they obtain from relationships. To do this requires increased trust in their partner, which comes with time and via experience. In fact, the routines take time to be placed in small companies which might hinder the capability development as was indicated in the formation of network capability (Torkkeli et al. 2015). Relational capital, such as trust, is one important characteristic of collaborating (Blomqvist & Levy 2006; Partanen et al. 2008). Moreover, Tolstoy and Agndal (2010) found evidence of underexploited resources in some networks, which ventures could have leveraged. This could be an indication of low collaboration capability (see also Torkkeli et al. 2015).

Activity	Dimensions				
Seeking	-To find different distribution channels (e.g. Research and Technology Organisations (RTOs), universities). -To identify the lead events and users to get pilot customers. -To evaluate the terms of relationships.	-To find competent sales personnel to train/advise doctors. -To select the right partners (assess capability) for mutual learning.	-To move early with sales activities (even with an unfinished product). -To create contacts to offshore users early in the innovation process to get feedback and create a market. -To match the time objectives of the partners (especially in academia).		-To aim for close proximity of partners. -To build 'strategic' relationships with some distributor/s to get user experiences.
Cooperating	-To learn and understand your own business.	-To collect and use information of international markets (being in the field). -To get all the information needed from the relationship and to develop solutions for manufacturers and suppliers.	-To handle long and demanding sales and relationship-building processes (to have enough resources).		-To evaluate pros and cons and find fitted distributors (learning and gaining experience).
Strategic		-To evaluate the strategic importance of the relationship to gain experience-based information from partners (formal contracts vs informal networking to exchange information). -To use relationships to gain credibility among 'future' clients.	-To avoid too much dependence on external resources. -To create inner and outer circle relationships, to ensure sufficiency of internal resources.	-To use relationships to multiple purposes & to create sales channel to meet the lead users and gain credibility.	-To maintain close relations with local (host) organisation (academia) and to keep an academic position at (host) organisation.
Dimensions of capability	Ability to seek and test different options for building relationships	Ability to create relationships to meet both tangible and intangible needs	Ability to time the access and use of external resources	Ability to transform one-way relationships into two-way (i.e. inward–outward)	Ability to maintain resilient relationships to grow/transform

Figure 21 Dimensions of the capability to collaborate and description of the categories

Timing creates the third critical dimension of collaboration capability. The dimension *"to time the access and use of external resources"* forms an important ability in the entrepreneurial internationalisation process, but seems to be a demanding task in new companies. Since companies are in need of external resources to get the invention launched on the market, they easily become too dependent on the external inter-organisational relationships which for one affect the progress of the entrepreneurial internationalisation process. This concern was also indicated in Ireland and Hine's (2007) study in organising pre-clinical trials. To evaluate the terms of relationships in critical resources is highly important to avoid drawbacks. The ad-hoc collaboration and internationalisation strategies could also be reasons for the lack of timing in new ventures (Torkkeli et al. 2015). However, industries differ significantly in terms of the length of innovation and business processes (e.g. Andersson et al. 2014), and the life science sector is one of the most demanding sectors in this regard due to the rigidity of sales processes, for instance. Starting companies should be aware of this fact as they plan their operations, but it is also one of the main reasons why timing should be strategic to companies. Although the altering nature of capability in internationalisation (Mort & Weerawardena 2006; Weerawardena et al. 2007), time has not been central focus in capability literature. In international new ventures rapid movement is inherently present (Sapienza et al. 2006). Sapienza et al. (2006) have however included timing as one of the dimensions in analysing internationalisation performance. They further made the claim that capabilities are often perceived only in a positive light.

As discussed earlier (see Section 4.6), it was noticed that companies' inter-organisational relationships were unidirectional, meaning that relationships provided links either inward or outward, but few did both. The fourth dimension *"to transform one-way relationships into two-way"* addresses this important ability to successfully utilise resources. As Figure 21 indicates, this dimension was not so much present in the data, but arose as one of the dimensions seen as strategically important in companies, even though it was not fully executed yet. To be able to build inward–outward links is one of the central aspects in internationalisation (Welch & Luostarinen 1993; Korhonen 1999) and in linking innovation process to internationalisation. In the international growth-seeking companies, building diversity of relationships (especially in offshore) and increasing this structural capital is essential (Chetty & Campbell-Hunt 2003; Partanen et al. 2008).

The last dimension of collaboration capability associated to entrepreneurial internationalisation relates to the social capital that is built in relationships. This is called *"an ability to maintain resilient relationships to grow/transform"*. Often social capital forms to personal relations which allow

shared understanding, for instance on strategic goals, to formulate in business relations (Dyer & Singh 1998; Partanen et al. 2008; Mitrega et al. 2012). Given that companies aim to enjoy international growth, some even in fast growth, inter-organisational relationships must grow and transform with the company. Therefore, relationships, at least with critical resources, should be strong and long-lasting, which seemed to be the case at least with R&D-related relations which companies have held since pre-internationalisation.

As the above five dimensions of capability illustrate, entrepreneurial cognition behaviour, meaning the perceptions of goals and means to achieve them (Mitchell et al. 2002; Bingham 2009; Autio et al. 2011), is necessary to be able to take full advantage of the opportunities relationships provide in entrepreneurial internationalisation. Although innovative and international growth-oriented companies begin seeking external resources from the beginning of the innovation development process that accumulate routines, this finding still indicates that the time window for building capabilities is often very tight because such experiences and routines take time to accumulate (cf. Torkkeli et al. 2015). However, as earlier studies in the life science field have indicated, it is important to have the ability to learn from existing relationships as the needs for relations differ in different states of internationalisation (Melén & Rovira Nordman 2007). Routines for collaborating take time to accrue, but new and small companies must succeed in building important inter-organisational relationships as often they have no choice given their focus on international niche markets that urge rapid internationalisation. Companies have to quickly make rational decisions regarding which resources to outsource and which to keep in-house. For an inexperienced company, the strategic objectives of building multi-purpose relationships are not always met, which leads to challenges in managing entrepreneurial internationalisation if too many critical resources are in the hands of partners. These companies might be lacking entrepreneurial cognition. To avoid these kinds of challenges, relationships that facilitate mutual learning are important. The willingness of partners to learn is crucial, which supports the learning-by-doing mentality that many innovative entrepreneurs prefer for internationalisation (see also Lindstrand et al. 2011).

Another significant factor in forming capability for entrepreneurial internationalisation is the background of the business and the attitude of the entrepreneur (Autio et al. 2011). The current results support studies that take into account the difference between technology and science, and market innovation (e.g. Andersson 2000; Brännback et al. 2007). In order to balance growth aspirations with a technology portfolio, a focus on core innovations is needed but often the ambitious technology orientation in companies drives them to increase their technology portfolio instead of concentrating on growth. For

instance, MedSignal stated that their growth had been hindered by a lack of courage to develop more complete products, but they have launched unfinished innovations. This is easily interpreted as lower market orientation that some internationalisation studies have identified as an important factor (Brännback et al. 2007); however, as the example suggests, concentration in innovation categories is neither easy nor straightforward. Most of the current cases seemed to follow a product strategy by having or developing multiple lines of innovation.

To summarise, the identified capability to collaborate in an entrepreneurial internationalisation process constitutes multiple dimensions that in turn emphasise that resource-seeking and deployment in starting, as well as in more experienced, ventures is a multifaceted process. It could be claimed that mere inward resource sourcing is not sufficient in entrepreneurial internationalisation process, but a more strategic approach to seek resources is needed. In this regard, resource scavenging offers internationalising companies valuable cross-border opportunities.

5.4 Synthesis and the revised framework for the interconnectedness of innovation and internationalisation processes

The objective of this study was to understand the interrelatedness of innovation and internationalisation processes in entrepreneurial internationalisation. In order to reach this objective, the role of innovation-related resource-seeking (i.e. inter-organisational relationships) and inward–outward links at different states of the entrepreneurial internationalisation process in five cases were investigated, and the dimensions of the capability to collaborate were identified. The main emphasis in the entrepreneurial internationalisation process was on pre-internationalisation due to the focus on innovation-based entrepreneurship, the development of technological innovation and venture creation (Schumpeter 1963; Drucker 1985).

In light of the findings, it is observed that innovative entrepreneurial companies engage in inter-organisational relationships to gain complementing resources early in their innovation development. However, routine and experience aspects of competence to seek external resources were revealed which suggested that more experienced companies are able to take advantage of complex inter-organisational relationship structures better than starting companies. These results reinforced the entrepreneurial state model to accelerated internationalisation developed by Freeman and Cavusgil (2007), and the study's framework emphasised the evolvement and intensification of inter-organisational relationships in entrepreneurial internationalisation (see

also Söderqvist & Chetty 2013). Similarly, this study also supported the behavioural internationalisation process model proposed by Johanson and Vahlne (1977; 2009) which claimed that commitment to the international market intensifies along with the company's experience and learning. Here, the intensification was created through the deployment of inter-organisational relationships for resource-seeking, and translating the inward to outward connections in the entrepreneurial internationalisation process.

Freeman and Cavusgil's (2007) model suggests that, at the strategist entrepreneurial state, which is the highest commitment state, the managerial attitude towards using network relationships is proactive, strategic and collaborative. In this study, this state was observed in more experienced companies who had built extensive inter-organisational partnerships. If Freeman and Cavusgil's model were perceived as a process model, the responder and opportunist states would equal pre-internationalisation in this study's framework. These are states in which awareness of internationalisation begins to grow; however, in contrast to Freeman and Cavusgil (2007), in the current framework, the entrepreneurial internationalisation is largely steered by integrated innovation development, which shows in greater international activities early, i.e. in pre-internationalisation.

Yet, it was witnessed that innovation and entrepreneurial internationalisation processes were tightly connected given that pre-internationalisation was calculated to start even three to nine years before the reference time in a venture's life. In this data, the reference time was judged based on a critical event in company, which crystallised a new start for the company's business, or the commencement of the business, rather than the registration of the company. These findings justified the firmer inclusion of pre-company history in innovative entrepreneurship studies (Helfat & Lieberman 2002; Hewerdine & Welch 2013). The findings have also offered support to the cyclical internationalisation process established by Jones and Coviello (2005), which emphasises that the entrepreneurial internationalisation behaviour process is not tied to a company's incorporation. In their view, these events might coincide or not in a cyclical process. They emphasised that the internationalisation patterns might have deeper roots in entrepreneurial history.

Furthermore, the partnerships were mostly formed with domestic organisations in pre-internationalisation, but evidence of cross-border relationships was also presented. Tight relations to domestic academia resulted from university research from which many of the companies' inventions or innovations originated. When tapping the inward–outward links, very minor evidence was found on inward links translating into outward links in the entrepreneurial internationalisation process, despite the expectation to observe more of these links in the data.

Yet, more interesting evidence was gained on the nature of resources sought. Intangible-tangible resource-seeking was the most preferred to build links between inward–outward internationalisation but also to develop competence to collaborate. Nevertheless, the inter-organisational relationship often held only either a tangible or an intangible dimension. It was further perceived that the resource-seeking behaviour companies followed resembled the recently introduced resource-scavenging approach in which external cross-border resources are exploited when encountered (Hewerdine et al. 2014). In this resource-seeking entrepreneurial internationalisation context, altogether five aspects of capability to collaborate were identified: (1) the ability to seek and test different options for relationship building; (2) the ability to create relations to meet tangible and intangible needs; (3) the ability to time access and use of external resources; (4) the ability to transform relationships into inward–outward type, and (5) the ability to maintain resilient relationships to grow/transform.

Evidence from this study supported the early capability formation proposed in the literature to understand the antecedents for developing capabilities (Sapienza et al. 2006; Autio et al. 2011). It was observed that some dimensions of capability extended to pre-internationalisation, but overall the data showed only a few examples of intangible-tangible resource relationships in the early days of innovation development. The development of these relationships was observed in later states of the entrepreneurial internationalisation process, which clearly indicates the learning and experience in committing to inter-organisational partnerships. This does, however, support the claim that investigating the roots of capabilities in conjunction with innovation provides access to micro-processes of international entrepreneurship (Mathews & Zander 2007; Autio et al. 2011). Furthermore, the roots of collaboration capability seem to extend to the early stages of entrepreneurial internationalisation in contrast to network capability, which has been showed to develop only with time lag (Torkkeli et al. 2015). Because this study did not investigate the development of collaboration capability as such, the contradictions in the findings are understandable given that network capability concentrates more on managing relationships that require organisational procedures.

As indicated earlier, the observed entrepreneurial internationalisation processes have a fairly extensive pre-internationalisation state which is useful for building not only international awareness but also actual engagement in cross-border relationships to seek resources. Therefore, following the thinking of Jones and Coviello (2005), the entrepreneurial internationalisation process is time-based and time-dependent when combined with another process because activities in one process somewhat steer activities in the other. Inward links in entrepreneurial internationalisation were often innovation-process

related. Nevertheless, the longer histories of companies could reveal the stronger relation between entrepreneurial internationalisation and the innovation process.

This study's framework, in contrast to Jones and Coviello's model, included inward activities and made explicit the technological innovation process to enhance the understanding of the innovation and the entrepreneurial behaviour in their model. Jones and Coviello (2005) perceived innovation rather as entrepreneurial behaviour to create cross-border entrepreneurial events; for instance, innovation can be related to new market entry rather than an innovative offering developed in the company. Consequently, the proposed framework is able to describe the early stages of company life, i.e. the innovation-related entrepreneurial activities, better given that these early activities are made explicit in contrast to Jones and Coviello's model. Overall, given that entrepreneurial internationalisation is in this study claimed to be a cyclical behavioural process, speed in innovative entrepreneurial companies' internationalisation might become secondary and internationalisation may be viewed more like an attitude, as emphasised by Freeman and Cavusgil (2007).

Reaching commercial markets requires technological capabilities but also entrepreneurial abilities, as noted by Schumpeter (1963, 88): "*and to carry out any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes*". Like the findings have also suggested, the personal experience, abilities and motivation of an innovator/entrepreneur should not be neglected. The characteristics of an innovation, for instance radicalness and technology push or market pull, determine the entrepreneurial internationalisation path, but equally influential is the entrepreneur's cognition towards growth (Gilbert et al. 2006; Knockaert et al. 2015).

Based on the findings, the tentative framework for the interconnectedness of innovation and internationalisation processes presented in Section 2.6 is revised by adding two dimensions, the international growth orientation and attitude of the entrepreneur and the intangible-tangible dimension of the resource. As Gilbert et al. (2006) noted, it is essential that entrepreneurs make the decision to grow, which applies to the internationalisation context as well. Given the suggested importance of intangible-tangible resources in building the inward–outward links in resource-seeking entrepreneurial internationalisation, and as a basis for the capability to collaborate to form, it is suggested that intangible-tangible resources form a stronger link between innovation and internationalisation compared to unidimensional (tangible or intangible) resources. The present study argues that innovative entrepreneurial companies should emphasise the creation of this type of inter-organisational relationships, preferably in the cross-border context, to internationalise.

In the revised framework (Figure 22), *"the entrepreneurial cognition to growth"* component is added as a pre-conditional factor for entrepreneurial internationalisation to take place in the entrepreneurial innovative company. It influences the company's willingness to create cross-border inter-organisational relationships, and in turn to engage in the resource-seeking and international behaviour which again determines the entrepreneurial internationalisation path the company will follow. The framework was further enhanced by making explicit the role of multidimensional resources (intangible-tangible) in forming the competence to take advantage of resource-seeking behaviour (i.e. capability to collaborate). These are emphasised with stronger lines and with the double two-way arrows in the figure. The stronger roles of resources in entrepreneurial internationalisation are marked as double plus signs (++) in the framework.

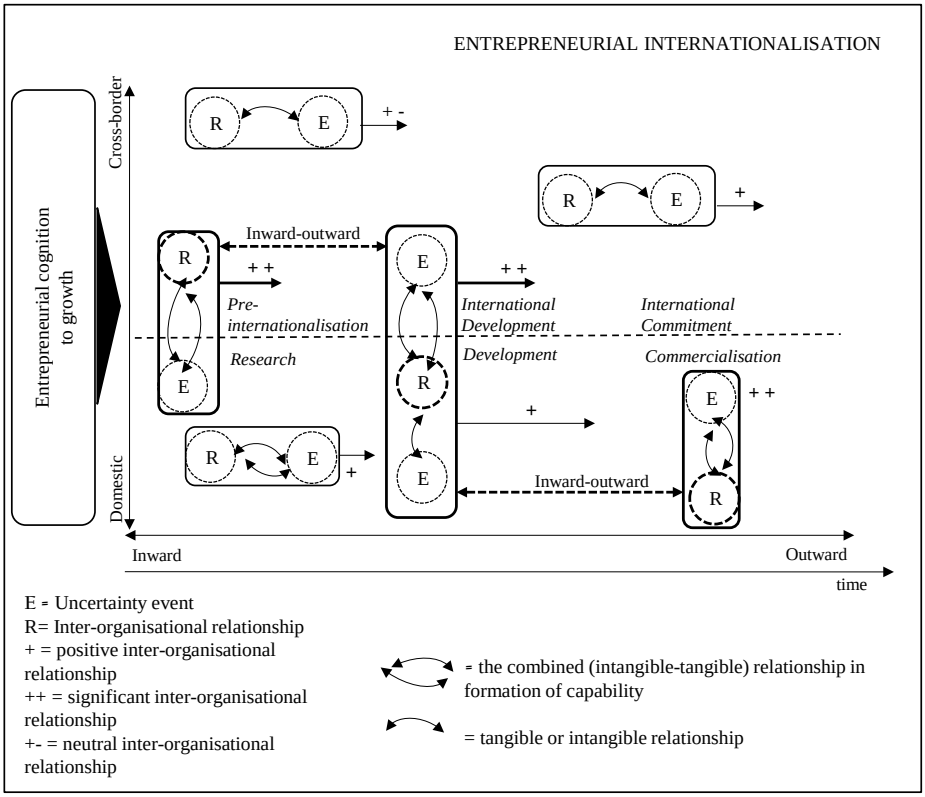

Figure 22 Revised framework for entrepreneurial internationalisation

As inter-organisational relationships are generally thought to have a positive effect on creating routines and, in turn, capabilities, all inter-organisational relationships are marked with plus signs (+). The role can also be

neutral (+-). Since it was proposed that the multidimensional resources are more prominent for building inward–outward connections in internationalisation, these resources are connected with two-way dashed lines. These inter-organisational relationships are foreseen as the most beneficial in entrepreneurial internationalisation and significant in forming the capability to collaborate. Therefore, these are attainable and desirable relationships in high-technology companies that wish to progress in the entrepreneurial internationalisation process.

To summarise, entrepreneurial internationalisation is a complex process which involves events at different levels in the company, from innovation to entrepreneurial endeavours (mainly venture creation) and internationalisation, as suggested by Mainela et al. (2011). It is also tightly integrated in the international environment because entrepreneurs exploit opportunities arising in a cross-border context. At the same time, it is cyclical as entrepreneurs are alert to change and prepared for contingencies and dynamism in resource-based entrepreneurial internationalisation. The entrepreneurial internationalisation process is based on learning and commitment cycles in resource-seeking; at the same time, the process itself is recursive as states of international development and commitment follow the cyclical innovation process in a company that maintains its product range within the same technological area.

6 CONCLUSIONS

6.1 Theoretical contributions of the study

The study offers a conceptualisation of entrepreneurial internationalisation that is perceived as a process. The main theoretical contributions are in the areas of international entrepreneurship and in the behavioural process studies of entrepreneurial internationalisation and resource-based internationalisation. The inclusion of the innovation-based discussion, namely the innovation process, in the internationalisation process theories has clearly contributed to the understanding of entrepreneurial internationalisation in the context of IE. Innovation development is a central act of entrepreneurial companies, and neglecting innovation process investigation from entrepreneurial internationalisation leaves potentially influential mechanisms unexplored.

As many scholars in IE have noted (e.g. Jones & Coviello 2005; Jones et al. 2011a; Autio et al. 2011; Mainela et al. 2011), greater understanding of the antecedents of entrepreneurial internationalisation is needed. International entrepreneurship scholars have potential to bridge the gap between innovation-based entrepreneurship (Schumpeter 1963) and internationalisation, but only recently have more entrepreneur- and entrepreneurial-focused approaches emerged in the IE literature (e.g. Melén Hånell et al. 2013). What this means is that it is important to investigate the previous experience and human capital of entrepreneurs, and activities preceding company incorporation. This study compiled understanding by integrating one important piece of early entrepreneurial activity into the discussion, namely the innovation process. Given that the earlier internationalisation studies in high-technology businesses (see Appendix 2 for a review of the literature) have vaguely described the role of innovation in internationalisation, the framework offers a novel approach by bringing innovation as a central variable in the entrepreneurial internationalisation process. As suggested in this study, internationalisation and innovation are strongly interrelated, and this evidence supports building a stronger link from innovation to entrepreneurial internationalisation in international entrepreneurship studies, as recommended by Ireland and Hine (2007). By bridging the gap between innovation and entrepreneurial internationalisation and taking a strong innovation process-focused research approach, the study was able to formulate the theoretical contributions to two main refined areas of

IE: *behavioural entrepreneurial internationalisation process* and *resource-seeking internationalisation* approaches.

First, despite the weak process study setting and insufficiency for strong process theorising (Welch & Paavilainen-Mäntymäki 2014), one of the main contributions of the study lies in its conceptualisation of the behavioural entrepreneurial internationalisation process. This is reached in two aspects. It strengthens the understanding of entrepreneurial internationalisation as *interlinked organisational processes* (cf. Jones & Coviello 2005: Mainela et al. 2011) that is still a fairly uncommon approach in internationalisation process studies. The aforementioned relation of innovation process to entrepreneurial internationalisation underlined the holistic perception on internationalisation in new ventures. This suggests the significance of a company's pre-history and the integration of activities in business processes. As argued earlier, innovation is not given as large a role in international entrepreneurship studies as it deserves, given that entrepreneurial internationalisation is driven by an innovation and rooted firmly in pre-internationalisation, a state which the findings showed consists mainly of innovation-development activities. Many of the international entrepreneurial competences start to form prior to company establishment, often long before incorporation.

Within the area of interlinked processes in the entrepreneurial internationalisation process, pre-internationalisation (e.g. Coviello 2006; Tan et al. 2007) offered a tool to investigate the early stages of venture life which, in light of the study findings, is a crucial phase in entrepreneurial internationalisation, not least because of its length in starting companies. It was shown that the alert entrepreneurs should evaluate what kind of collaboration to seek, where resources are found, and which markets to enter at the early stages of innovation development. Internationalisation process investigation that starts from the incorporation of a company, or the first outward engagement, may provide partial and less profound explanations, for instance, of resource deployment and capability development, as also argued by Mathews and Zander (2007) and Hewerdine and Welch (2013). Following Jones and Coviello (2005), the findings from this study account for extending entrepreneurial internationalisation process investigations to activities preceding the start of internationalisation. This study argued that the entrepreneurial internationalisation process gains explanatory power if the histories of the innovation and entrepreneur are assessed. Combined with innovation, resource and capability discussions, new understandings of the roots of strategic competencies for entrepreneurial internationalisation are achieved.

As the second aspect related to the entrepreneurial internationalisation process, the model of entrepreneurial internationalisation suggests the learning and commitment cycles in resource-seeking as potential process mechanisms

in the entrepreneurial internationalisation process. These are seen to be based on the inward–outward connection in the internationalisation process. This perception supplements the inherent idea of the inward–outward approach of translating an inward link into a later outward connection in internationalisation (e.g. Welch & Luostarinen 1993). The study's findings suggest, in accordance with earlier studies (e.g. Welch & Luostarinen 1993; Korhonen 1999; Jones 1999; 2001), that inward cross-border activities in innovative ventures are significant in international endeavours. Yet, it was found that the inward–outward connections are based on learning and experience, namely in the creative use of inter-organisational relationships. In opposition to earlier findings (Karlsen et al. 2003), inward–outward links are suggested to increase as entrepreneurial internationalisation intensifies, given that the experience of inter-organisational relationships simultaneously accumulate and capabilities form. International entrepreneurial companies operate in dynamic international environments that make alertness to changes and preparedness for contingencies in international growth essential characteristics for entrepreneurs. Although the evidence was not strong in this study, the potential that the inward–outward approach brings to the assessment of the process of entrepreneurial internationalisation justifies its better integration in international entrepreneurship studies. In particular, the inward–outward approach offers value to resource-seeking-based investigations of entrepreneurial internationalisation.

The second area of theoretical contribution is related to the resource-based internationalisation in IE. Instead of applying the traditional resource-based view on exploiting resources to build competitive advantage and seek new markets (e.g. Barney 1991; Amit & Schoemaker 1993), this study concentrated on how new ventures seek resources to grow internationally (e.g. Di Gregorio et al. 2008; Hewerdine et al. 2014; Schweizer 2014). The proposed framework advances a resource-seeking internationalisation approach by demonstrating that inward–outward inter-organisational relationships form early in the innovation process and potentially aid entrepreneurial companies to pursue internationalisation from the beginning of the company's lifecycle. It was also demonstrated that certain types of inter-organisational relationships are more beneficial to entrepreneurial internationalisation than the others. The beneficial relationships incorporated intangible and tangible resources and made them more prone for creating inward–outward links.

The framework of entrepreneurial internationalisation offers scholars a structure which helps them to understand the resource-based internationalisation in innovative companies. A major benefit of this resource-seeking internationalisation pattern identification is that it enables researchers to distinguish international growth potential ventures, for instance, those who

exploit resource-scavenging approach. Adopting a process perspective and making explicit the resource-seeking and deployment aspect offer understanding on the accumulation of resources in new ventures. A strong emphasis is again placed on activities taking place in the pre-internationalisation, which stresses the importance of the pre-history of an innovative entrepreneurial company as discussed earlier. Following the RBV, IE literature has traditionally focused on the assumption that international new ventures and entrepreneurs hold unique human, technological and so on resources that are exploited in internationalisation (Oviatt & McDougall 1994), without paying that much attention to how these resources are sourced and developed in ventures. This study shows how innovative new companies seek external resources and how these resources translate into value in their entrepreneurial internationalisation process by creating learning-based inward–outward links. By adopting a resource- instead of market-seeking approach (e.g. Hewerdine et al. 2014), this study illustrated that internationalisation extends to early stages of innovative companies, and that in high-technology companies' potentially significant cross-border relationships have started to form long before incorporation.

IE discipline is young, and only recently have studies on resource-seeking in entrepreneurial internationalisation appeared. This study contributes to the understanding of resource-based internationalisation by connecting a resource-seeking approach to the behavioural internationalisation process model. Resource-seeking is used as means for ventures to build an international entrepreneurial company; as emphasised by Ahokangas (1998), resources are embedded in internationalisation, since entrepreneurial internationalisation is not likely to take place in a company without engaging and adjusting external, preferably cross-border resources. This is emphasised in the findings, which supported the resource-scavenging approach recently introduced in the international entrepreneurship literature by Hewerdine et al. (2014). Given that the approach was originally identified in an innovative firm context, it is not surprising to find characteristics of scavenging internationalisation behaviour in the present study as well. However, although the term 'scavenging' might give the impression of a less-organised search for external resources, this is not what the findings indicate. More likely, the term emphasises the utilisation of each relationship fully and creatively to leverage in entrepreneurial internationalisation. Accordingly, this study argued that resource-scavenging in entrepreneurial internationalisation demands strong collaboration capability. These findings emphasised the learning aspect of the cyclical entrepreneurial internationalisation process, and the framework reveals the antecedents of accelerated internationalisation, showing how resource-seeking-based entrepreneurial internationalisation takes place. International entrepreneurial

companies not only possess unique resources, but they also seek and build domestic and cross-border resources to create value in an international context. This already takes place during innovation development and venture creation, not after the innovation is commercialised and sales begin.

Furthermore, because this study concentrated mostly on starting ventures which were still in the innovation-development stage, the investment-intensive resource-seeking modes, as suggested in Ahokangas' (1998) model, were largely missing in entrepreneurial internationalisation. Instead of placing emphasis on only the resource-seeking modes in the international entrepreneurship context, this study supports rather the addition of geographical proximity to the resource sourcing, which offers information about with whom these entrepreneurial companies form relationships. This approach integrates innovation with entrepreneurial internationalisation but also links the resources to the internationalisation process by creating inward–outward links. All the above findings of resource deployment increase understanding of resource-based internationalisation in the international entrepreneurship context, which has not received full attention in resource-based approaches due to the conventional focus on internal resource development and accumulation (cf. Mathews 2002; Tolstoy & Agndal 2010).

Given the tight integration of resource- and capability-based views (Helfat & Peteraf 2003; Winter 2003; Autio et al. 2011), and the contemporary conceptual move from resource to dynamic capability discussion, the third area of theoretical contributions is found in the capability literature in IE. Due to the empirical limitations of the study, it cannot be labelled as a capability-based internationalisation study, but there is yet some learning stemming from resource-based entrepreneurial internationalisation to contribute to the capability discussion. Namely, this study made explicit the relationship between resources and capabilities by showing that not all inter-organisational relationships are equally important to form the collaboration capability; rather, some are more important than others. The framework proposes a mechanism for necessary capabilities to form in resource-seeking entrepreneurial internationalisation, and research was able to identify significant dimensions of one substantial capability. The study made explicit the antecedents for forming a capability to collaborate, which helps to study and understand the birth of capabilities.

Second, the findings indicated that the quality of relationships is central even in building routine-based capabilities that make the development of inter-organisational relationships strategically important for companies, especially for international growth-seeking ventures. This resulted in the revelation of the differences between network and collaboration capability (cf. Torkkeli et al. 2015), of which the latter supports leveraging resources in entrepreneurial

internationalisation. Both types of capabilities are required in resource-based internationalisation since resources have to be efficiently combined in partnerships (e.g. Tolstoy & Agndal 2010) as well as strategically exploited in company.

Although not in the focus of the study, some specific contributions to innovation studies, in particular the innovation collaboration literature, are also found since this study offers more knowledge and empirical evidence of innovative companies' foreign collaboration and shows that starting companies engage in foreign collaboration early in their innovation lifecycle. Findings further indicated that the early foreign inter-organisational relationships potentially enhance a company's international success. Since success of innovation collaboration is often assessed by the amount and type of collaboration partners, this study brings enhanced understanding that the nature of relationships is more important than the amount of partners in small starting ventures who suffer from human resource restrictions to manage multiple innovation relationships. This issue has direct implications to measuring innovation, performance of innovative companies and design of innovation surveys, like the Community Innovation Survey. In addition, the findings regarding resource-seeking patterns in new ventures offer insights into ecosystem creation as they revealed with whom the start-ups partner, and the potential significant actors in the ecosystem. These innovation resource interdependencies are a central mechanism in ecosystem creation (e.g. Thomas & Autio 2014).

6.2 Policy and managerial implications

The policy implications of this research target mainly small, highly innovative firms which are argued to benefit most from innovation and entrepreneurship policies (Lindholm Dahlstrand & Stevenson 2010). While innovation policy aims to foster development of R&D and innovation, entrepreneurship policy aims to stimulate the entrepreneurial environment and growth potential of new ventures (Lindholm Dahlstrand & Stevenson 2010). Internationalisation of companies is, in turn, often addressed in SME policies. Ideally these policy areas should work together in a holistic manner, but in reality the multiple policy agendas, especially in small economies like Finland and Austria, are difficult to attain simultaneously since needs of companies vary. Regardless of the specific needs of different policy areas, this study highlighted some general and some more specific issues relevant to all areas needed in promoting entrepreneurial internationalisation of innovative companies.

First, policies targeted to international growth companies should be designed to get companies attached to an external (preferably international) resource pool early. Internationalisation promotion is still quite export-focused, but integrating internationalisation services in earlier stages of company life would help innovative companies gain crucial contacts in the international arena of innovation. For instance, it would be beneficial for resources that are purposefully sought from the target markets to build a connection to the future client base. Yet, international networking and collaboration-targeted initiatives should be more focused on fostering actual co-development than networking. This would lead to the co-sharing of resources and knowledge, and additional know-how sharing among small businesses (and other innovation actors) at the European level. Further, it would help to build the innovation ecosystems that are currently on the innovation policy agenda. Furthermore, companies would benefit from a well-working public pilot environment, for instance, to conduct clinical trials, not only in domestic but in foreign hospitals as well. Indirect access to foreign hospitals, and other possible technology pilot platforms, could be provided via domestic research actors (universities and research organisations) who already have foreign research contacts. Systematically built test environments would make access to resources at critical stages of the innovation process easier for companies, and potentially prevent unnecessary prolongation of commercialisation and internationalisation. Yet, resource co-sharing would require some adjustments in the criteria of national R&D subsidies to allow efficient (international) resource sourcing. Access should also be ensured to starting companies who might suffer from scarce financial resources, rather than being reserved only for companies close to commercialisation and internationalisation.

Second, one-size-fits-all innovation and internationalisation policies might be detrimental as organic-growth companies wish also to pursue international growth but might not benefit most from the match-making events with venture capitalists and business angels. They might actually require counselling and training services to boost their motivation and skills. Besides, these slow-growth-preferring entrepreneurs might be able to create more sustainable international growth businesses because of their better business skills due to the vast experience accumulated via learning-by-doing. Another important, more general issue for implementing policies to innovative companies is that instruments should be designed according to innovative companies' lifecycle stage rather than their age of incorporation. Since the business processes are often cyclical, even older companies might face a new 'start-up phase' and would benefit from public support at this new stage as well.

As a final general policy implication, it is recommended that policy instruments and initiatives should have more patience. This applies, for instance, to

organic-growth-pursuing companies as entrepreneurial and organisational capabilities take time to accumulate, but the necessary time has to be taken in case a company wishes to facilitate its own growth path. A second area related to patience is the relatively short collaboration projects between academia and industry due to the short horizon of public funding instruments. The short-sightedness is not the best-suited mean to build relationships for resource-sharing, for instance.

In addition to policy implications which also touch entrepreneurs directly, some recommendations for managing small businesses' entrepreneurial internationalisation arose. The main managerial implication relates to the strategic approach to building inter-organisational relationships in innovation. Since it is important and necessary for companies to get access to external and international resources early, these relations should be exploited fully which calls, for instance, for setting purposeful and goal-oriented objectives for inter-organisational collaboration. For example, if a collaboration relation does not serve the purpose, it should be terminated. However, in reality, this is difficult as starting companies are dependent on the resources (often informal) collaboration relationships offer.

In addition, designing entrepreneurial internationalisation should contain creativity and courage that translate, for instance, to the scavenging of foreign resources. Courage relates also to an international growth attitude, more specifically a willingness to grow that, especially in entrepreneurial and family-owned businesses, might be missing at the right time and place. One cure for increasing growth potential in innovative small business is to help entrepreneurs (regional) to network and cluster to learn from each other. To change experiences of, for instance, regulation-related issues lowers the perceived challenges related to internationalisation. One good example of this kind of open business culture can be observed currently in the game industry; other sectors would benefit from an open sharing and learning-advancing business culture.

At large, inter-organisational relationships should be seen as an intangible asset companies can utilise, for instance, in attracting venture capital. If a company is able to make explicit its collaboration relations, for instance with foreign distinguished actors, that company has invested in intangible capital, and most importantly is aware of these investments itself. In starting companies, the value of the company is often dependent on intangible assets such as its collaboration and business networks.

To summarise, the general implication to both managers and policy-makers is that internationalisation should be more profoundly integrated to innovation development.

6.3 Limitations of the study and future research

The limitations of this study are centralised into two main areas, theoretical and methodological limitations. These could be addressed in future research. The major theoretical limitations are seen in the alternative approach to build the study framework and the use of specific theories.

First, a firmer concentration on a few main theories only would indeed have been an alternative approach for conducting the study. The aim of the research was, however, to build the theoretical framework by synthesising different theoretical perspectives from internationalisation process studies, resource-based internationalisation and innovation process studies, and in this way contribute to the international entrepreneurship literature. Focusing, for example, on the Uppsala model would have offered the study the chance to make stronger contributions to process theories of internationalisation, but due to the lack of process data such a strong process theory focus was not attainable in the study.

Secondly, the network theory of internationalisation was considered as an alternative theoretical lens but neglected. It was considered that, since the research concentrated first and foremost on micro-processes internal to a company and looked at how dyadic inter-organisational relationships are used in internal processes, the resource view to internationalisation was adequate. The aim was not to analyse the changes in a company's resource network structure in entrepreneurial internationalisation. The main premise of network theory of internationalisation is that the markets are seen as networks of relationships (Johansson & Mattsson 1988). The network partners' possession of important resources for the focal firm's internationalisation is consistent with my study, but was substituted with a resource-seeking perspective (Ahokangas 1998; Hewerdine et al. 2014) because I was interested in the creation of international entrepreneurial venture.

Furthermore, the studied dimensions (tangible-intangible) of inter-organisational relationships could have well been evaluated using the weak and strong ties, an approach adopted in network theory (Granovetter 1973) or alternatively discussed through the direct and indirect ties of collaboration network introduced by Ahuja (2000). Again, network theory would have been a valid choice for the theoretical lens, but a conscious decision was made in the early stages of the research to seek and use alternative theoretical perspectives with stronger relation to (internationalisation) process research.

On the side of methodological limitations, while the focus on one sector was also a strong point of the study, this focus only made the findings highly contextualised. Adding a comparative industry context would have offered valuable insights into the overall use of cross-border inter-organisational

relationships in entrepreneurial internationalisation, as this study indicated relatively low collaboration for innovation among the studied radical innovation-developing companies. The life science sector is known to be one of the sectors in which collaboration takes place, but including cases from another collaboration-intensive sector could have enriched the results. Given that fairly little collaboration relations were observed, it may be that the secrecy surrounding scientific breakthrough innovation prevents some companies from engaging in partnerships. It could be interesting to see if more partnerships in companies involved in developing low-technology products are observed. Given that the data had some variation within the life science sector, some generalisation of the findings can be made to the group of high-technology and innovative companies. Rather than pointing to any specific sector, the generalisability of the findings is found in the group of companies incorporating similar characteristics that many sectors hold, given that all sectors known as high-technology hold different types of innovative entrepreneurial companies. First, similarities are found from science-based companies who are involved in translating scientific invention to innovation, and who operate in strongly regulated, high-cost and high-risk environments. The second element relates to the market, to the public expert customer base (like hospitals and doctors) that creates long and challenging sales processes. In these markets, innovation is often systemic. These types of companies are found, for instance, in the clean tech sector, where technologies for recycling, renewable energy or sustainable transport are developed and commercialised in international niche markets.

The second area of methodological limitation is that this study operated with limited interview material, and data could have been intensified with additional interviews in different states of the entrepreneurial internationalisation process. Yet, the longitudinal setting was not feasible to include in this study. For instance, the formation of capability was left superficial due to the unavailability of strong process data and only dimensions of capability were identified. For future research, it would be interesting to analyse the formation of collaboration capability in inter-organisational relationships in a longitudinal research setting that pays more attention to entrepreneurs. The identified collaboration capability dimensions could be used as a starting point. This kind of direction has already been pursued in a recent study by Marion et al. (2015). In addition, changes in collaboration capability in the entrepreneurial internationalisation process would be a valuable subject for future studies.

Furthermore, more evidence of resource-seeking internationalisation behaviour is needed, and it is urged to replicate a similar case study setting to other industry contexts, for instance to non-high-technology-intensive sectors to confirm or disconfirm the findings of this study and the results of

Hewerdine et al. (2014). Yet, the resource-seeking internationalisation proves to be an approach particularly suitable to innovative companies. A non-entrepreneurial context would also be an interesting setting for future research as it seemed that entrepreneurship influenced strongly the findings of this study. It would be interesting to see how the resource-seeking behaviour changes along the internationalisation process, but such a study would again demand a longitudinal data and research setting. These studies could well benefit network theory-based approaches, such as those discussed in the theoretical limitations of this study.

Last, one piece of general advice to the international entrepreneurship studies is to link research more strongly to the innovation and to the pre-founding activities of ventures, because the findings of this study clearly indicate the interrelatedness of innovation with the entrepreneurial company's international growth, regardless of the internationalisation strategy, technology or market adopted. International entrepreneurship as a scholarly field is still developing and would benefit from, for example, process studies that steer the research in explaining the mechanisms of entrepreneurial internationalisation.

7 SUMMARY OF THE STUDY

This study was motivated by the important role of innovative and international growth-seeking companies in national economies and innovation systems to create novel innovations and employment. Much public effort is placed on nourishing these kinds of companies, but still internationalisation and international growth are challenging to achieve (Ireland & Hine 2007). Therefore, this study was interested to know how highly innovative companies gain international growth. More specifically, the objective was formulated as *how innovation and internationalisation processes are interrelated in entrepreneurial internationalisation.* The study approached the phenomenon from entrepreneurial innovation (Schumpeter 1963) and resource-seeking internationalisation (Ahokangas 1998; Hewerdine et al. 2014) perspectives. The objective was approached through the following research questions:

- What role do inter-organisational relationships in innovation have in the entrepreneurial internationalisation process?
- What kind of inward–outward links do inter-organisational relationships create in the resource-seeking-based entrepreneurial internationalisation process?
- What kind of capability to collaborate forms in the interaction of inter-organisational relationship deployment?

A review of the existing literature showed a research gap in resource-based entrepreneurial internationalisation process research. Internationalisation and venture growth have been studied vastly, but integration of entrepreneurial innovation and resource-seeking perspectives into the examination provided a new angle. From the literature, it was clear that specifically understanding the role of innovation-related inter-organisational relationships in the early stages of entrepreneurial internationalisation, as well as antecedents of competence to collaborate in the interaction of innovation and inward–outward internationalisation processes demanded more attention. The identified research gaps were approached with empirical evidence from five cases.

The discussion in Chapter 5 showed that engagement in domestic and cross-border inter-organisational relationships in the entrepreneurial internationalisation process takes place early, but it was also presented that the role of cross-border relationships was minor in younger companies' internationalisation journeys. Because of this less significant role observed, the relationship of translating inward to outward links in entrepreneurial internationalisation

was less evident as well. It was found that inward and outward links were individually exploited in the entrepreneurial internationalisation process since pre-internationalisation, but the integration of inward to outward links in later states was largely missing, indicating a low strategic focus on resource scavenging in entrepreneurial ventures. Furthermore, as presented in Section 5.3, five dimensions of collaboration capability were identified from the inter-organisational relationships. These dimensions are argued to be significant in pursuing resource-seeking entrepreneurial internationalisation. This evidence supports that the proposed research questions were answered in an adequate manner.

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APPENDICES

APPENDIX 1 Selected empirical studies of innovation collaboration in SMEs.

	Focus of study	Method & data	Geographic scope	Duration	Approach	Theoretical lens
Rothwell & Dodgson (1991)	External collaboration management problems in innovative SMEs	Case study	n/a	n/a	Innovation collaboration	Innovation management
Rosenfeld (1996)	Impact of inter-firm collaboration in SMEs	Case study	n/a	n/a	Innovation collaboration	Innovation studies/policy
Freel (2000)	Innovation-related small firm external linkages	Survey	Regional vs non-regional; domestic vs overseas	Single vs recurrent contacts	Innovation collaboration	
Bougrain & Houdeville (2002)	SMEs' research capacity in exploiting external knowledge	Quantitative	n/a	n/a	Innovation collaboration	Transaction cost theory, evolutionary theory, absorptive capacity
Freel (2003)	Link of cooperation with firm-level innovativeness	Quantitative	Spatial distribution: local, regional, UK and overseas.	n/a	Innovation collaboration	Absorptive capacity, Innovation studies
Narula (2004)	R&D collaboration in SMEs relative to large firms	Mixed methods	Domestic / international	n/a	Innovation collaboration	Innovation studies, R&D networking
Freel (2005)	Labour quality and skills and firm-level innovativeness	Survey	n/a	n/a	Innovation collaboration	RBV / Absorptive capacity

Chen et al. (2006)	Inter-organisational knowledge transfer in SMEs	Survey	n/a	n/a	Open innovation (OI)	Knowledge management
Freel & Harrison (2006)	Cooperation in SMEs	Survey	n/a	n/a	Innovation collaboration	Innovation studies, R&D networking
Freel (2006)	Patterns of innovation expenditure, and innovation networking	Quantitative	n/a	n/a	Innovation collaboration	Innovation studies
Fukugawa (2006)	Small firm networks on knowledge-sharing and R&D cooperation	Survey	n/a	n/a	Innovation collaboration	Networks
Muscio (2007)	Contribution of ACAP to firm's capability to interact with other organisations.	Quantitative	n/a	n/a	Innovation collaboration	Organisational learning
van de Vrande et al. (2009)	Incidence of and trends towards OI in SMEs	Survey	n/a	n/a	Open innovation (OI)	Innovation management, Organisational learning
Lim et al. (2010)	Technological evolution and changes in inter-firm relationships	Case study	n/a	n/a	Open innovation (OI)	
Lee et al. (2010)	OI strategies in SMEs, and network model with intermediary involvement	Survey	n/a	n/a	Open innovation (OI)	Innovation management
De Jong & Freel (2010)	Absorptive capacity in extending geographical distance of innovation-related collaboration	Survey	Geographic distance in km.	n/a	Innovation collaboration	RBV / Absorptive capacity
Neyens et al. (2010)	Time frames of alliance strategies on innovation performance	Quantitative		Continuous - discontinuous	Innovation collaboration	KBV
O'Regan & Kling (2011)	R&D outsourcing in SMEs	Survey			Open innovation (OI)	RBV
Spithoven et al. (2011)	Building absorptive capacity at the inter-organisational level	Mixed methods study	n/a	n/a	Open innovation (OI)	Absorptive capacity
Lasagni (2012)	External relationships in small business innovation	Survey	n/a	n/a	Open innovation (OI)	
Gronum et al. (2012)	Contribution of networks to innovation and SME performance	Quantitative			Innovation collaboration	Networks

APPENDIX 2 A review table of the selected studies on high-technology SME internationalisation.

	Focus of study	Definition of innovation/ innovativeness	Method & data	Main results	Theoretical lens, approach
Crick & Jones (2000)	Overseas expansion process	R&D intensity	Case study	Companies' internationalisation is part of overall decision-making processes, and they use different entry modes.	IE, internationalisation
Spence & Crick (2006)	Internationalisation strategies; critical factors and management team's perception in decision-making	High-technology sector	Case study	Initial and subsequent strategies result from planned and/or unplanned opportunity recognition and exploitation depending on individual circumstances.	IE, internationalisation strategy
Preece et al. (1998)	Factors associated with young technology-based firms' international establishment	Technology-based firm	Survey	Resources are important explanatory factors in intensity, but in diversity attitude less important. At large alliances did not matter.	IE
Crick & Spence (2005)	Planned or unplanned opportunity recognition and exploitation in internationalisation strategies	High-technology sector	Case study	Strategy formation is not as systematic as some previous studies, notably those that focus on the 'stage' models, suggest.	IE, decision making/strategy
Keogh et al. (1998)	Aspects of companies' innovation processes, focusing on the linkage with internationalisation	Innovation	Case study	Innovation and internationalisation strategies are equally important to the internationalisation process.	IE
Burgel & Murray (2000)	Foreign market entry forms	R&D intensity	Quantitative	Entry mode choice is a trade-off between resources available and support requirements of customer.	IE, RBV
Libaers & Meyer (2011)	The role and impact of industrial clustering in internationalisation	Inventive prowess expressed in patents owned	Quantitative	In the life sciences, non-serial innovator firms slightly outperform their serial innovator peers in export performance.	RBV, density dependence theory

Knight & Cavusgil (2004)	Role of innovative culture and organisational capabilities in the adoption of internationalisation and performance	Global technological competence & innovative culture	Mixed methods (case study, survey)	BGs leverage a distinctive mix of orientations and strategies that allow them to succeed in diverse international markets regardless of scarce resources.	RBV, KBV, capabilities
Kocak & Abimbola (2009)	Key enabling resources and capabilities that facilitate firms' early internationalisation process	Innovation	Case study	Organisational structure, entrepreneurial processes and marketing, and learning orientation are significant factors.	RBV, KBV, capabilities
Hewerdine et al. (2014)	Resource dimension of the international behaviour	High-technology sector	Case study	Internationalisation can take the form of searching, prospecting or "scavenging" for resources.	RBV, IE
Bloodgood et al. (1996)	Antecedents and outcomes of the extent of internationalisation	R&D expense	Quantitative	Product differentiation as a source of competitive advantage and international work experience of board directors are directly related to internationalisation.	RBV
Zahra et al. (2003)	Influence of intangible and tangible resources to sales internationalisation	Technological resources	Survey	Reputation is important in explaining the degree of sales internationalisation.	RBV, capabilities
Saarenketo et al. (2004)	Contribution of knowledge and capabilities to the rapidity and extensiveness of internationalisation	High-technology sector	Survey	International companies have better technological and marketing skills than domestic companies. BGs utilise more partners and networks, which enables firms to learn and get to the foreign markets quicker.	KBV (RBV)
Filipescu et al. (2009)	Relationship between technological innovation and internationalisation of the firm	Innovation	Case study	Internationalisation and technological innovation processes should expand and mutually reinforce each other to gain competitive advantage.	RBV, gradual internationalisation theory
Tolstoy & Agndal (2010)	Commercialisation of innovations in resource networks.	New offerings	Case study	Network resource combinations vary with the nature of the venture, NIPVs and NIMVs. The former exploit a complex set of network	RBV, capabilities, network studies

				resources; the latter depend on a narrower scope.	
Partanen et al. (2008)	Critical preconditions of network mobilisation in early growth	Science- and technology-based sector	Case study	Different networks and relationships are important in the transitional periods of growth. Role of social capital varies in deploying partnerships and network relationships.	IE, network studies
Coviello & Munro (1997)	Influence of network relationships on internationalisation process	High-technology sector	Case study	Internationalisation process is an accelerated version of the stage model, and is driven by formal and informal network relationships.	IE, network studies
Vasilchenko & Morrish (2011)	Entrepreneurial social and business networks in internationalisation	New technology-based firms	Case study	Social networks are instrumental in exploring internationalisation opportunities, lead to collaborative cooperation and facilitate exploitation of internationalisation opportunities.	Network studies
Prashantham (2006)	Network relationships in internationalisation	Knowledge/technology intensity	Case study	Foreign spatially scattered network relationships are significant resources. Proactive use of networks recommended.	Network studies
Mort & Weerawardena (2006)	Networking capability in the internationalisation processes	High-technology sector	Case study	Networking capabilities change in the internationalisation process. Role of international entrepreneurial founder is critical.	IE, capability, network studies
Styles & Genua (2008)	Internationalisation of firms created through the commercialisation of academic research	New technology	Case study	Networks of academics assisted in the identification of initial opportunities to internationalise, especially in the pre-internationalisation stage.	IE, network studies
Ireland & Hine (2007)	Success factors influencing the management of business and science imperatives	High-technology sector	Case study	An ability to foster innovation and increase a firm's intellectual capital influences the firm's ability to grow. Firms that harmonise their science and business agendas more successfully will progress more quickly.	IE, growth

Autio et al. (2000)	Effect of firm's start of internationalisation in its development, and how that affect the rate of its subsequent international growth	Knowledge intensity	Quantitative	Earlier start of internationalisation and higher knowledge intensity are associated with faster international growth. Imitable technologies facilitate faster growth.	KBV, international growth
Gabrielsson et al. (2008)	Three phases of born globals: introductory, growth and resource accumulation, break-out	Unique products with a global market potential	Case study	Risks, resource development, networks and organisational learning develop during the growth process.	IE, growth
Gabrielsson & Gabrielsson (2013)	Growth phases in the high-technology business-to-business field	High-technology/R&D intensity	Case study	The decision-making logic moderates the impact of identified factors, e.g. impact of opportunities, resources and capabilities, entrepreneurial orientation, and learning.	IE, growth
Wakelin (1998)	Importance of different determinants of trade behaviour, in particular the role of innovation	Innovation	Quantitative	Innovating and non-innovating firms behave differently in terms of both the probability of exporting and the level of exports. The implication is that the capacity to innovate changes the firm's behaviour.	Internationalisation
Vila & Kuster (2007)	Importance of innovation for firms involved in international marketing; comparison of innovative and less innovative enterprises	Innovation	Survey	The present results have demonstrated that not all types of innovation dimensions are required for internationalisation. The extent of a firm's internationalisation affects innovation in terms of strategy and processes.	Internationalisation
Boter & Holmquist (1996)	Comparison of internationalisation in traditional manufacturing and innovative firms	Innovation	Case study	The internationalisation process is context dependent (industry, company, people).	Internationalisation process
Freeman et al. (2013)	Managers' movement through the de-internationalisation to re-internationalisation process	High-technology and knowledge-intensive products and processes	Case study	Moving between outward- and inward-oriented activity as firms de-internationalise and re-internationalise.	Internationalisation process

Rovira Nordman & Melén (2008)	Relation of knowledge of founders and managers to the firms' discovery and exploitation of foreign market opportunities	R&D	Case study	Different kinds of BGs follow different internationalisation processes; therefore, these should not be analysed as a homogenous group.	Internationalisation process, KBV, IE
Yli-Renko et al. (2002)	Social capital in international growth	Technology-based firm	Quantitative	Entrepreneurs' and employees' personal networks play an important role and provide information. Knowledge is a core resource for international growth.	Social capital theory, KBV, international growth
Tolstoy (2010)	Knowledge combination in networks	High-technology sector	Case study	Proactive strategies of identifying and implementing knowledge combinations that span across internationally dispersed network relationships shape international venturing. Different strategies for international product and international market ventures.	KBV
Zahra et al. (2000)	International expansion, firm's technological learning and the effects of this learning on the firm's financial performance	High-technology sector	Survey	International diversity and high-control entry modes increase technological learning. International diversity and mode of entry have a direct positive effect on performance, and a more indirect effect on increasing technological learning.	KBV, capabilities
Jantunen et al. (2005)	Entrepreneurial orientation and a firm's reconfiguring capabilities on international performance	R&D expenditure	Survey data	Entrepreneurial orientation and reconfiguring capabilities have an effect on international performance and provide empirical support for the dynamic capability view of the firm.	IE, dynamic capabilities
Filipescu et al. (2013)	Dynamics of firms operating abroad in terms of effects of innovation on exports and vice versa	R&D intensity; innovation	Quantitative	Innovation and exports have a reciprocal causal relationship. Shows a double causality chain between innovation and exports.	Internationalisation (exports)

APPENDIX 3 Innovation process models I and II.

Innovation process models I

Source	Marquis (1988)	Maclaurin (1953)	Rogers (1983)	Schumpeter (1963)	Schmookler (1966)	Kline & Rosenberg (1986)	Rothwell (1994)
Activities	1) Recognition	Development of pure science	1) Recognition of a problem or need	1) Basic science	1) Market demand	1) Potential market	Marketing
	2) Idea formulation	Invention	2) Basic and applied research	2) Design and engineering	2) Development	2) Invent	R&D
	3) Problem-solving	Innovation	3) Development	3) Manufacturing	3) Manufacturing	3) Design/test	Product development
	4) Solution	Finance	4) Commercialisation	4) Marketing	4) Sales	4) Redesign	Production engineering
	5) Development	Acceptance	5) Diffusion and adoption	5) Sales		5) Distribute/ market	Parts manufacture
	6) Utilisation and diffusion		6) Consequences			Research & knowledge	Manufacture
Domain	**n/a**	**Technological**	**n/a**	**Technological**	**Technological**	**Technological**	**Technological**
Name of the model	**Process of innovation model**	**Science push model***	**The Innovation Development Process [diffusion model]**	**Technology-push model 1st generation**	**Demand-pull model 2nd generation**	**Chain linked model 3rd generation**	**Integrated model 4th generation***

* The authors do not propose a strict order of activities, but the innovation process is integrated.

Innovation process models II

Source	Martin (1984)	Cooper (1988)	Veryzer (1998)	Holt (1988)	Van de Ven (1999)
Activities	Scientific invention	1) Idea	1) Dynamic drifting phase	1) Preconception period	1) The initiation period (gestation, shock, plans)
	Engineering/development	2) Preliminary assessment	2) Convergence phase	2) Innovative period	2) The development period (proliferation, setbacks, criteria shift, fluid participation of organisational personnel, investors/top management, relationships with others, infrastructure development)
	Entrepreneurship	3) Concept	3) Formulation phase	3) Post-innovative period	3) The implementation/ termination phase (adoption, termination)
	Management	4) Development	4) Preliminary design phase		
	Recognised social need	5) Testing	5) Evaluation preparation phase		
	Supportive environment	6)Trial	6) Formative prototype phase		
		7) Launch	7) Lead user testing phase		
			8) Design modification phase		
			9) Prototype phase		
			10) “Commercialisation" phase		
Domain	**Management**	**Management**	**Management**	**Management**	**Organisational**
Name of the model	**The innovation chain equation***	**Stage-gate model**	**Discontinuous product innovation process**	**Innovation process**	**Innovation journey pattern**

* The author does not propose a strict order of activities, but the innovation process is integrated.

APPENDIX 4 Results of the pilot study.

Table 4a: Most significant innovation resource sourcing mechanisms.

	CROSS-BORDER		DOMESTIC	
	International firms (n=84)	Non-international firms (n=54)	International firms (n=84)	Non-international firms (n=54)
Own R&D	28%	12%	89%	83%
Short-term				
Contract R&D	7%	-	38%	37%
Acquisition of equipment, material, components or software	25%	29%	44%	56%
Purchase of IPRs	5%	7%	11%	15%
Purchase of other knowledge (information), e.g. market surveys, technological information	20%	5%	33%	27%
Public services (e.g. ELY-centre or foreign equivalent)	5%	2%	34%	34%
Mid-term				
Training (own or ordered)	6%	2%	35%	39%
Co-development and knowledge exchange (project based, including cooperation with research organisation)	13%	10%	35%	34%
Strategic partnership, long-term cooperation with another company	35%	-	52%	44%
Long-term				
Joint venture	4%	-	4%	7%
Recruitment of R&D personnel	4%	-	17%	17%
Equity investment in another company	-	-	1%	7%
Acquisition of R&D unit or company	-	-	1%	2%
External investors' participation in the executive committee	-	-	13%	15%

Note: Responses are on a significance scale of which only the most significant, i.e. values 'great significance' (1) and 'significant' (2), are reported in this table.

Table 4b: Most significant indirect innovation resource sourcing mechanisms.

	CROSS-BORDER		DOMESTIC	
	International firms (n=84)	Non-international firms (n=54)	International firms (n=84)	Non-international firms (n=54)
External informant (e.g. trade promoter, innovation promoter)	4%	-	14%	12%
Participation to research programmes (e.g. Tekes technology programme, EU framework programme)	19%	5%	34%	37%
Participation to collaboration networks (e.g. social networks)	34%	17%	47%	61%
Industry federations, chambers of commerce	6%	2%	14%	12%
Conferences, trade shows and exhibitions	48%	29%	41%	39%
Scientific journals and trade journals	42%	34%	25%	49%

Note: Responses are on a significance scale of which only the most significant, i.e. values ‘great significance’ (1) and ‘significant’ (2), are reported in this table.

APPENDIX 5 The interview guides.

Main themes of interview guide: MedBio

Topic: SMEs and internationalisation of knowledge and innovation activities

1. Company profile & history
    a. Respondent's background

2. Innovation activities

Note: Preferably identify an innovation you concentrate on in the interview. This can be the latest innovation the firm has developed or the core technology its business is based on.

    a. When was the first innovation commercialised?
    b. Type of innovation/s
    c. Please describe the innovation process steps

3. Internationalisation

Note: How do these relate to the cross-border K&I sourcing? Has internationalisation boosted cross-border K&I sourcing?

    a. History of international activities
    b. Which are the current market areas? Internationalisation modes?

4. Innovation sourcing/R&D collaboration

Note: Innovation knowledge identification, transfer and absorption.

    a. Technology/R&D cooperation strategy?
    b. Motives for R&D collaboration?
    c. Identification: How does the company identify external knowledge sources (domestic and foreign)?
    d. Transfer: What kind of external innovation sourcing has the company engaged in?
    e. Absorption: Does the company engage in co-creation/joint development?
    f. Challenges in cross-border innovation sourcing?

5. External conditions and policy
    a. What kind of external conditions would enhance the use of cross-border knowledge?
    b. How do the current policy incentives suit external (cross-border) knowledge sourcing?

Interview instructions and main themes: MedHeart and MedImage

Topic: Innovative entrepreneurship

Instructions for the interview: The topic of the study was revealed in the e-mail correspondence with interviewees. State in the beginning of the interview that you are interested in getting 'the story' (of the innovative entrepreneur) out rather than steering the interview with detailed questions. Let the interviewee tell his/her story about developing an innovation and starting the current business until today.

The main question: How are innovativeness and entrepreneurship entangled together in idea generation, establishment of business, development and growth?

Themes to cover (inquire after the story has been told):

a. Innovation development
b. Motivation for entrepreneurship
c. Setting-up a business: process and strategy
d. Innovation persistence (continuous innovation)
e. Networks (business and innovation)
f. Collaboration
g. Internationalisation
h. Regionality
i. Capabilities/learning in different phases of firm/innovation development

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Main themes of interview guide: MedSignal and MedLife

Topic: Interrelatedness of innovation and internationalisation processes

Empirical problem setting: The empirical question is centralised to innovation commercialisation, and is driven by understanding better this often problematic (outlined by innovative entrepreneurs themselves) phase of the innovation process. The working hypothesis is that cross-border links (e.g. collaboration) in earlier phases in the innovation process contribute to commercialisation and internationalisation.

Academic problem setting: The study looks at the interrelationship of innovation and internationalisation processes and is interested in innovative entrepreneurial firms' internationalisation behaviour. More specifically, this is done by examining innovation collaboration at pre-internationalisation.

1) Innovation/entrepreneur/firm history
   a. Origin of innovation/development/commercialisation

b. Motivation for entrepreneurship

2) Innovation development
   a. What have been the success events/milestones? Drawbacks?
   b. Innovation process description
   c. What intentional external linkages were made during innovation development?

3) Entrepreneurship
   a. What have been the highlights of entrepreneurship? Drawbacks?
   b. Innovative vs international entrepreneurship
   c. Entrepreneurship readiness and orientation
   d. Opportunity creation vs opportunity recognition (proactive vs reactive approach)

4) R&D collaboration (in all phases of the innovation process)
   a. How is collaboration initiated? Domestic and foreign.
   b. Does the firm have a collaboration strategy?
   c. What is the objective of collaboration? At what stage does collaboration happen?
   d. What kinds of collaboration forms does the firm pursue?

5) Internationalisation
   a. First international sales, year and country?
   b. Existence of internationalisation strategy? Year (and phase of firm lifecycle) when created?
   c. How has the internationalisation strategy materialised so far?
   d. Current market areas?
   e. What are the firm's internationalisation plans for the next 5 years?
   f. How have the cross-border linkages in earlier phases of the firm aided in internationalisation?

APPENDIX 6 Additional secondary interviews in the life science sector.

Time and place	Interviewee	Time of interview
6.4.2011, Helsinki	Aleksi Soini, CEO, Mobidiag Oy	68 minutes
16.9.2011, phone interview	Emeritus Prof. Pertti Törmänen, Bioretec Oy/ University of Tampere	Not recorded
5.9.2011, Espoo	Mirja Mokkila, Key Account Manager (in health promoting food), VTT Technical Research Centre of Finland	Not recorded
29.4.2010, Helsinki	Terhi Kajaste, CEO, Fihta Ry	74 minutes
13.2.2013, Austria	Dr Florian Becke, Expert in Life Sciences & Industrial Property Rights, CAST – Center for Academic Spin-offs Tyrol	Not recorded
13.2.2013, Austria	Dr Petra Stöckl, Programme Manager Life Sciences, Standortagentur Tirol Roland Fuchs, Project Manager Medical Technology	60 minutes

APPENDIX 7 Example of the data analysis: inter-organisational relationships.

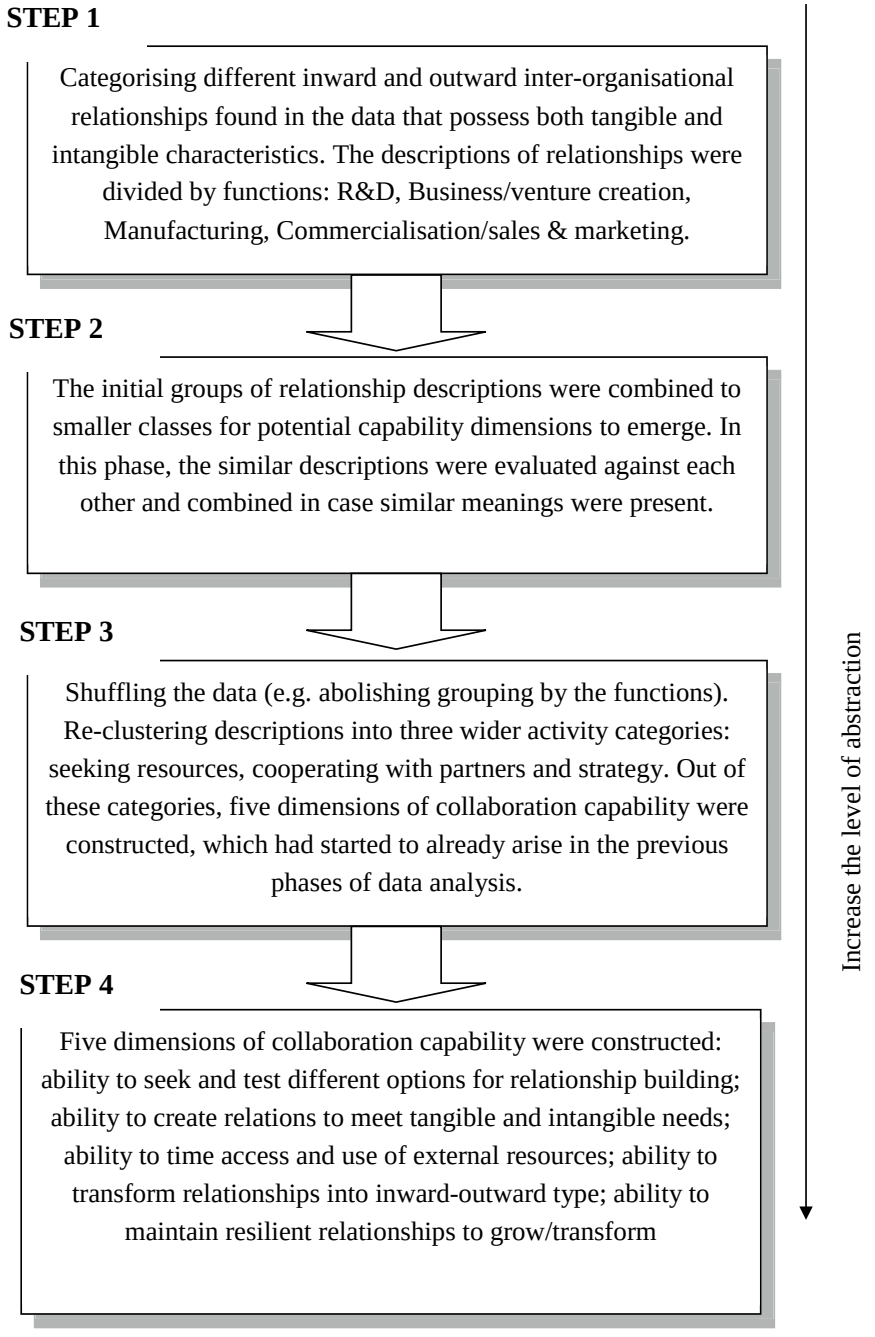
Example 1 of data the analysis.

Quote from the primary data	*"Also, he was looking for partners. Before he spoke with industry and other partners and, he had managed to come along with, finding the resources for a technical environment, so this was his motivation behind this."*	*"the input of [partner's name withdrawn] was very important in terms of, they've been a start-up. … the person we were working with, he was … quite familiar with the situation that you're in an early phase, how you can … satisfy regulatory things in the very early phase, how you can find ways."*
To which function does the collaboration relate?	R&D	Business and venture creation
What kind of link relationship forms in internationalisation (inward vs outward)?	Relationship was formed to bring in missing resources, therefore typified as an inward link.	Inward link was created to bring lacking resources.
Is the partner located at home or abroad?	Partner is located in the same city with the company.	Partner is from the neighbouring country.
What kind of dimension/s does the resource hold?	Relationship had only tangible characteristics and was used for filling a resource need.	Relationships filled a tangible resource need but had also a strong intangible component as advice for running the business was offered to the starting business.

Example 2 of the data analysis.

Quote from the primary data	"*We have sought sales, of course, to the home market but also abroad, with our own crew. We have been looking for applied solutions, so we have sold the devices to research organisations along the way, quite a lot actually. In this way, we have sought distribution channels, and now we have some 20, and even above, distributors around the world. We have been systematically searching these distributors*."	*"And it was great that [person's name withdrawn] understood this immediately already in 2005 as we discussed, given that all people were obliged to NDA.*" *"And [person's name withdrawn] was via [agency's name withdrawn] helping us, as an advisor. But he was also later helping us to apply funding*."
To which function does the collaboration relate?	R&D and commercialisation	R&D
What kind of link relationship forms in internationalisation (inward vs outward)?	Combined inward and outward since relationship started from R&D collaboration but has extended as a customer relationship.	Early innovation related to inward relationships, when the inventor was just starting the development.
Is the partner located at home or abroad?	Collaboration partner is located in the US.	Both experts are domestic.
What kind of dimension/s does the resource hold?	Relationship started as a tangible R&D relationship but combined intangible characteristics later.	Both persons were able to give additional motivational advice and are therefore seen as intangible resources.

APPENDIX 8 Analysis process and example of the data analysis: capabilities.



Example of the data analysis for constructing capabilities.

Quote from the primary data	*"the input of [partner's name withdrawn] was very important in terms of, they've been a start-up. … the person we were working with, he was … quite familiar with the situation that you're in an early phase, how you can … satisfy regulatory things in the very early phase, how you can find ways."*	*"We have sought sales, of course, to the home market but also abroad, with our own crew. We have been looking for applied solutions, so we have sold the devices to research organisations along the way, quite a lot actually. In this way, we have sought distribution channels, and now we have some 20, and even above, distributors around the world. We have been systematically searching these distributors."*
1) To which function does the collaboration relate?	Business and venture creation	R&D and commercialisation
2) Dimensions of international organisational relationship?	Intangible/tangible	Intangible/tangible
3) What kind of need does the international organisational relationship fulfil? *(Step 1 in capability construction)*	Partner offers investment (financial resources) but also start-up advice. Partner has also been in the same situation (start-up); therefore, its experience is highly appreciated by the focal company.	RTOs with company also collaborated with are seen as important customers. Company starts to use these relationships systematically to organise sales.
4) What is the ability provided by the relationship to achieve international growth? *(Step 2 in capability construction)*	To evaluate the strategic importance of the relationship to gain experience-based information from partners (formal contracts vs informal networking to exchange information).	To use relationships to multiple purposes
5) What is the (higher) objective of getting engaged in collaboration? *(Step 3 in capability construction)*	Strategic	Strategic
6) What (higher) ability is this construct related to? *(Step 4 in capability construction)*	To create relationships that meet both tangible and intangible needs	To transform one-way relationships into two-way, i.e. inward-outward type

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