Accessing Entrepreneurial Competencies through Networks: A Longitudinal Study of University Spin-off Emergence

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Abstract

We develop theory to better understand the role of networks in accessing the entrepreneurial competencies required to create new ventures within the academic environment. We follow the initiation and early development of four university spin-offs within the UK and Norway. Following a competency perspective, we observed how each nascent venture relied on strong and weak network ties to access three critical competencies needed during the start-up process. The usefulness of different types of network ties depends on the competency sought and varies throughout the start-up process. Ventures developed opportunity refinement competency through leveraging existing weak ties to industry partners and then building stronger ties to help exploit their novel technologies. By contrast, resource acquisition and championing competencies were accessed through initially building upon strong ties to resource providers and colleagues, and subsequently developing new weak ties to raise further resources and augment the entrepreneurial team. Theoretically, we synthesize the competency perspective with network theory to develop propositions to guide future empirical work. Our approach provides a novel multi-level and process oriented framework for understanding the role of networks in new venture emergence.

Keywords: Entrepreneurial competencies, networks, resource acquisition, university spin-off ventures

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1. Introduction

A growing body of literature has investigated the importance of networks for the initiation and growth of new entrepreneurial ventures (Elfring and Hulsink, 2007; Hite and Hesterly, 2001; Nicolaou and Birley, 2003b) and the exploration of new technologies (Gilsing et al., 2008). Network relations act as a bridge to access information and resources that supplements the entrepreneurs’ or nascent firms’ own resources. Yet the characteristics of networks appear highly context specific. For instance, significant differences are seen between networks from different industry sectors and due to differences in technology and knowledge transfer schema. In addition networks can appear highly dynamic and can evolve alongside technology, industry, and firm emergence, maturity, and decline (Malerba and Orsenigo, 1996; Nelson, 1995).

High technology sectors such as pharmaceuticals, biotechnology, ICT, and telecoms have shown significant increases in alliance activities both between firms and with universities and research institutes (Nelson and Rosenberg, 1993). Differences in technology and knowledge type appear equally influential. Industries with complex and expanding knowledge bases where the locus of innovation appears within networks are replacing industries where innovation occurs predominantly within individual firms (Malerba, 2002). Here a distinction is seen between the utility of strong network ties, characterized by frequent interactions and a high level of trust, and weak network ties characterized by infrequent interactions and significantly lower levels of trust (Granovetter, 1973; Yli-Renko et al., 2001). It is proposed that strong ties within tightly connected networks may be most suitable for the diffusion of existing knowledge, whereas weak ties between a diversity of firms and universities may be more suitable for the exploration of new knowledge (Walker et al., 1997).

Of particular significance for academic researchers are changes in networks over time. From a firm perspective such dynamics are challenging. It is proposed that start ups can enhance early performance by establishing broad networks to overcome the liabilities of newness at a reduced cost (Greve and Salaff, 2003; Jack, 2005). Yet as firms develop the balance between accessing new resources through networks and developing internal, hard to imitate resources is delicate, especially within high technology sectors. Consequently authors have called for more fine grained research into network development within specific contexts (Stuart and
Sorenson, 2007). Nascent high technology ventures appear particularly interesting due to their technological complexity and the fast moving market dynamics (Elfring and Hulsink, 2007).

Network studies usually view networks either as an independent or dependent variable (Hoang and Antoncic, 2003), but lack a more holistic treatment of how networks are used to develop nascent ventures. We argue that by considering competency development within such dynamic ventures, novel insights can be gained regarding the utility of different network characteristics. Nascent ventures need access to a broad set of different competencies to be able to proceed from an idea to a value creating firm. In the literature, terms such as competencies, capabilities, resources, assets, and skills are used interchangeably (Danneels, 2002). We follow Danneels (2002, p. 1102) and define a competence as an ‘ability to accomplish something by using a set of material and immaterial resources’. Competencies are related to individual resources and have material as well as cognitive components. As proposed by Hayton and Kelley (2006, p. 410) ‘situationally specific individual competencies involve identifiable sets or combinations of individual characteristics, specifically knowledge, skills, and personality characteristics’.

For most nascent ventures these competencies are not readily available, but have to be developed or acquired during the early phases of their development. These initial phases involving the processes of venture development, or organizational emergence (Lichtenstein et al., 2006) have largely been neglected (Davidsson and Honig, 2003). Understanding these processes is important since findings regarding the development of competencies and capabilities based on established firms may not be transferable to new firms (Zahra et al., 2006).

We focus our investigation on the creation of spin-off firms based on academic research. Due to the early stage and embryonic nature of university technologies (Agrawal, 2006; Jensen and Thursby, 2001), their high knowledge content, and the many actors involved, these spin-off firms may face substantial hurdles that make them well suited to reveal how networks are used to fill competency gaps. University spin-offs are situated within an institutional context where their development may be inhibited by a lack of business experience and commercial skills among academics (Vohora et al., 2004) and possible conflicts of interest with other university tasks (Anderson, 2001; Mustar et al., 2006). Because the nature of the opportunity developed by university spin-offs is relatively well defined (Ardichvili et al., 2003), it is
possible to control for some of the variation in opportunity, which is a limitation in much of the existing research on human agency in entrepreneurship (Shane et al., 2003).

Although many studies have looked at how networks contribute to the university spin-off firm formation process (Elfring and Hulsink, 2003; Grandi and Grimaldi, 2003; Nicolaou and Birley, 2003b; Walter et al., 2006), there is a gap in the literature related to which competencies are provided through the networks and whether the role of networks vary at different stages of the process. Filling this gap is important to understand how emerging spin-off ventures assemble the competencies to enable them to develop and yield insights for refinement of practice and policy as well as for researchers.

We focus upon the early stages of venture formation, arguably the most influential in terms of the path upon which the venture evolves (Clarysse and Moray, 2004; Lounsbury and Glynn, 2001). Within this early stage, we can observe the competencies required to make the transition from academic research to the recognition of a potential commercial opportunity (Vohora et al., 2004) and the role of networks in the venture start-up process (Aldrich and Kim, 2007). Yet this presents another significant challenge. It is not typically apparent until many years following the initial recognition of such a technological opportunity that the opportunity is validated in terms of market acceptance. Therefore, understanding of the entrepreneurial process is typically deduced retrospectively. We resolve this challenge by investigating the process longitudinally and by using a third party validation to provide a proxy for the eventual market acceptance of that technology. We propose that an early stage investment from a private sector investor is an indicator of the likely commercial viability of the opportunity (Grandi and Grimaldi, 2005; Lockett and Wright, 2005). By observing the acquisition of competencies necessary to gain such investment we can therefore better understand the role of networks in developing nascent ventures. Thus, we pose the following research question: How do nascent university spin-off ventures make use of networks to access the competencies used to gain initial external investment?

We make several contributions to the literature on networks and entrepreneurial competencies. First, by integrating social network theory with the entrepreneurial competency perspective, we gain a better understanding of the different purposes of strong and weak ties within networks. Second, our longitudinal approach made it possible to capture changes in the use of networks over time and show that for each competency, strong and weak ties are used
at different phases in the ventures’ development. As such we add to the scarcity of studies on the process of network development (Hoang and Antoncic, 2003; Slotte-Kock and Coviello, 2010) and the lack of longitudinal studies in this area (Jack, 2010). Third, and more generally, we add to the emerging insights as to where competencies come from. Fourth, by focusing on the competencies, rather than specific actors, we aim to resolve the level of analysis problem (Alvarez and Busenitz, 2001) and incorporate the contribution from multiple levels to the spin-off process.

This article proceeds as follows. Section 2 presents our theoretical framework which keys into the competencies needed to launch a university spin-off venture and the potential role of networks in accessing these competencies. The third section presents the methodological approach used for the longitudinal study of four university spin-off processes. Section 4 presents our analysis and derives propositions regarding key characteristics of the competencies needed during the early stages of the university spin-off process. Finally, conclusions and implications for further research and practice are provided.

2. Theoretical framework

2.1. The role of networks in accessing competencies

It is clear that entrepreneurial firms make use of many different types of relationships to develop their ventures (Lechner et al., 2006). The development of university spin-offs is often characterized by a dynamic interaction of different individuals with different competencies throughout the start-up process (Clarysse and Moray, 2004; Vanaelst et al., 2006). A number of studies have pointed to the importance of the parent university and other university related actors for spin-off development (Lockett and Wright, 2005; Murray, 2004; Shane and Stuart, 2002), but equally important is the contacts with external actors such as industry partners, investors, and customers (Wright et al., 2004b).

Recent studies have shown that social capital plays an important role for nascent entrepreneurs (Davidsson and Honig, 2003) and academic entrepreneurs (Mosey and Wright, 2007; Murray, 2004). However, different network characteristics appear advantageous at different stages of new venture creation and development (Hite and Hesterly, 2001). Strong
ties are necessary for the initiation of entrepreneurial activity while weak ties are more suited for rapid gestation activities (Davidsson and Honig, 2003). Arguably, the most important resource for a new venture is the entrepreneur or the team. The resource acquisition process appears, however, highly iterative and involves many different actors.

The core assumption of the network perspective is that new ventures can mitigate the liability of newness by constructing an appropriate network and managing the network over time (Steier and Greenwood, 2000). Although many studies have looked at the structure, content, and governance of networks (Hoang and Antoncic, 2003), few have examined the specific role that networks play in the early development of new firms. To help understand how networks influence the emergence of nascent university spin-offs, we consider the type of entrepreneurial competencies needed to develop such ventures and the likely use of networks for developing each competency.

2.2. **Entrepreneurial competencies**

Entrepreneurial competencies are elusive. The entrepreneurship literature points to the role of individuals, the discovery and development of opportunities, and the acquisition of resources to exploit the opportunity as key aspects of the entrepreneurship process (Bruyat and Julien, 2001; Stevenson and Jarillo, 1990). Thus, we argue that a distinct set of competencies related to opportunity refinement, resource acquisition, and championing are required to succeed with new venture creation within the non-commercial academic environment. Access to each of these competencies is, however, likely to be facilitated by the type of networks the new venture is connected with. In the following, we will explain the role of each of the three competencies included in our framework.

First, the recognition of opportunities is a necessary element in the creation of new ventures (Eckhardt and Shane, 2003; Shane, 2000). The identification of entrepreneurial opportunities is a cognitive act, with different individuals playing different roles throughout the entrepreneurial process (Eckhardt and Shane, 2003). Technological resources are fungible (Penrose, 1959) and the resulting market application of technological inventions and knowledge is rarely clear from the outset (Danneels, 2007; Gruber et al., 2008; Shane, 2000). Business models are altered as entrepreneurs improve their knowledge about resources and
opportunities (Drulhe and Garnsey, 2004). As a result, a competence in opportunity refinement arguably has a significant impact upon the early development path of nascent spin-off ventures. Hansen (1999) suggests that weak ties are useful to help find easily codifiable knowledge but for the transfer of complex knowledge, strong ties between partners is necessary. Bozeman and Corley (2004) observed a similar difference when considering scientists’ collaboration strategies. Here ‘cosmopolitan’ collaborations with a more diverse group were seen to help develop research momentum yet stronger ties with mentors helped facilitate more complex collaborations with industry partners. These studies suggest that the nature of ties for academic entrepreneurs may need to change over time to develop their nascent technologies into marketable opportunities.

The second key concept in the entrepreneurial process is the assembly and organization of resources to exploit the opportunity (Brush et al., 2001). The resource-based literature has found that financial capital, physical assets, technological resources, human capital, and organizational resources are important for new ventures. Intangible ‘soft’ resources are more useful than tangible resources in the early stage of development (Lichtenstein and Brush, 2001). The resource acquisition process is, however, highly iterative and involves many different actors with the appropriate competencies or capabilities. The network literature highlights how new firms can gain access to resources through networks (Hite and Hesterly, 2001; Yli-Renko et al., 2001). However, given the traditionally non-commercial character of universities, there may be significant heterogeneity in the availability of access to resource acquisition competency (Ahuja and Katila, 2004). Such variance is likely reflected in network structures and subsequent resource access. Murray (2004) observed significant differences in resource acquisition for academic ventures depending upon the inventor’s links to their local laboratory and the wider community. Nicolaou and Birley (2003a) argue that differences in network structures ultimately influence the development path of the venture. Differentials in initial relationships with resource providers such as technology transfer offices and equity investors were seen to result in significant variance in venture performance.

Third, entrepreneurship involves human agency (Shane et al., 2003), and there is a need for someone to take a championing role in the venturing process (Burgelman, 1983; Gupta et al., 2006). Champions induce the commitment of others to the innovation by providing emotional meaning and energy to the idea (Howell and Higgins, 1990). We propose that the championing competency is therefore crucial for nascent technology ventures to overcome the
early stages of development. University spin-offs may be championed by academics, external entrepreneurs, or a combination of both (Nicolaou and Birley, 2003a). Knowledge-based new ventures are often developed by teams, rather than by single individuals (Clarysse and Moray, 2004; Roberts, 1991). Moreover, university spin-offs are often characterized by the dynamic interaction of different individuals with different competencies throughout the start-up process (Clarysse and Moray, 2004; Roberts and Malone, 1996; Vanaelst et al., 2006). Empirical studies have shown that networks are instrumental in accessing championing competency. Kassicieh et al. (1996) found that academics having strong ties to colleagues who were entrepreneurs were more likely to engage in venture creation. This is supported by studies of academics showing that local group norms play a more significant role in commercialization behavior than university policies and structures (Bercovitz and Feldman, 2008; Louis et al., 1989). Yet how academics can build such relationships with champions outside academe is less clear (Franklin et al., 2001).

To sum up, it seems reasonable to claim that the most important competencies needed during the early stages of the entrepreneurial process will be linked to many different actors both within and outside the university. Clearly, the use of networks is important to access these competencies, but how the use of networks is linked to each competency and how the use of networks evolves over time remains little explored.

3. Methodology

3.1. Research design

To examine the use of networks to access competencies, a case study approach was chosen, guided by the competency framework outlined above (Suddaby, 2006). This approach gives a richer contextual insight and an in-depth understanding of processes that have been neglected in prior studies (Rothaermel et al., 2007). From previous literature reviewed above, it seems clear that different competencies are used at different times in the spin-off process and that the role of networks also change over time. Thus, a longitudinal approach is warranted to capture such dynamic effects and reduce problems of retrospective biases (Pettigrew, 1990). The use of comparative case studies is appropriate to gain insight into organizational phenomena over time (Eisenhardt, 1989). We mapped the initiation and early development of four university
spin-offs using a longitudinal research approach. To enhance the external validity, we selected cases from different settings.

3.2. Case selection

We seek to identify competency access through networks that transcend significant contextual variation. Thus, we adopted theoretical sampling (Eisenhardt, 1989) and chose to study cases within different national, university, and industry contexts (Yin, 1989). First, we selected cases from the UK and Norway which represent distinct institutional contexts. In the UK, commercialization of research has been high on the agenda since the 1990s and an infrastructure of technology transfer offices (TTOs) is well established at most universities. British universities have been highly active in spin-off creation compared to other countries (Wright et al., 2007). In contrast, Norwegian universities have only recently become formally involved in spin-off formation. While previously belonging to the individual academic, IP ownership of academic research was from 2003 assigned to universities. This led to the establishment of TTOs at Norwegian universities, increased awareness within the institutions, and increased public spending to facilitate commercialization of research.

Second, in each country we chose one university with a relatively well developed institutional infrastructure for technology transfer and spin-off venture formation and one university with a less comprehensive commercialization support tradition. Third, to capture different environmental contexts related to market and business environment we included cases from two contrasting research disciplines; biological sciences and engineering. As found by Mosey and Wright (2007), there might be differences in the nature of social capital between these disciplines. Finally, we chose cases where the technological basis for the spin-off was based on university research and the academic researchers played an important role in the initiation and development of the spin-off project. Because we searched for projects in early stage of development, prospective cases had to be identified through key informants at the universities and access had to be negotiated. Table 1 shows central properties of the selected cases.

INSERT TABLE 1 HERE
3.3. Data collection

Data triangulation by including several sources of data was used to map the situation and critical events prior to and during the development of the four spin-off projects. Primary data from the spin-off projects was collected by personal interviews at each case conducted at regular intervals throughout a 12-18 month period from spring 2004. People in various positions were interviewed including: company founders and entrepreneurial team members, researchers, university managers, and people involved in commercialization support (see Table 2). Following a narrative approach (Polkinghorne, 1988), the interviewer asked the respondent to describe his or her involvement in and knowledge of the spin-off project from its inception to date, with a minimum of interruption by the interviewer. This type of narrative interviewing (Czarniawska, 1998, p. 29) enabled us to get closer to the actual events and to avoid personal views and theoretical perspectives influencing the data collection. A total of 54 interviews were conducted. Interviews were recorded and transcribed by two of the authors as part of the data analysis process.

INSERT TABLE 2 HERE

For each firm, archival data, including financial reports, business plans, market analyses, and research documents, was obtained. In addition, relevant written documentation was collected both from respondents and other sources like magazines, newspapers, and the internet. By combining the different sources of information and by collecting information over a period of time through repeated interviews with central people, an in-depth description of the research and commercialization process was obtained. For confidentiality reasons the cases are anonymized.

3.4. Data analysis

The collected data provided both narrative accounts of the process (Czarniawska, 1998; Pentland, 1999) and factual descriptions of context, actors, and events from a large number of sources. From the data we identified critical characteristics and events that influenced how the spin-off process emerged and developed in the university context. The interview transcripts and other material were read and reread as data were collected; emerging themes were refined as this process progressed and checked through the repeat interviews with the main players.
(Yin, 1989). The views of the different respondents from each case were also compared. To derive theoretical explanations for the processes observed, we identified observations that matched theoretical concepts (Borch and Arthur, 1995). As the analysis proceeded, the overarching logical frame shifted from exploring data using retroduction to verifying theory through deduction (Van de Ven and Poole, 2002). In order to avoid confirmatory biases, one of the authors did not participate in data collection (Doz, 1996). The data analysis was undertaken in two-ordered steps (Taylor and Bodgan, 1984). Initially, a first-order analysis of the competency development within each case revealed how networks were used to access competencies, as summarized in Table 3. This was followed by a second-order analysis to develop propositions through analytical generalization (Yin, 1989). The results of the second order analysis are presented in Sections 4.1 to 4.3.

4. The use of networks in accessing competencies

Despite the unique technologies and markets and the different national, university, and business environments exhibited by the four cases, each eventually gained external private sector finance. Each case approached the goal via differing paths and from different starting points, yet remarkable similarities were seen regarding the use of networks to gaining the competencies needed. Without exception, the actors involved acknowledged the need for competencies to develop the latent value within their technologies to attract potential investors. For instance, an advisor involved in the Beta case explained: ‘It is difficult to know how to commercialize an idea; to sell ‘air’ is difficult, so you need competence. [...] I think many commercialization projects fail because a lack of competence.’ (O1 - see Table 2).

In Table 3 we present the development of each case related to opportunity refinement, resource acquisition, and championing, as outlined in the competency framework.

INSERT TABLE 3 HERE

We aimed to identify the type of networks used to access competencies during the initial start-up process of a university spin-off venture. The balance between developing internal competencies and accessing external competencies appears to vary between the cases, but the projects were not able to proceed towards obtaining external financing until all three competencies were sufficiently accessed. The complexity of the new venture creation process
often resulted in much iteration within their networks and the purposive development of new networks to be able to develop and acquire the appropriate competency. Conceptually, the competencies do not need to be acquired in any particular order. Rather, they seem to be built in parallel and through iteration.

We discuss our findings related to each competency in more detail below and derive propositions related to the use of networks to access each competency.

4.1. Opportunity refinement

Although academic research was a necessary condition for the business opportunity to be created, it was not sufficient for the new venture process to start. Some form of market related competence was also needed to initially frame the business idea. In all cases, the university researchers played a very important role in the earliest stages of this process, while other actors played an increasingly important role in later stages, as illustrated by one of the Alpha founders: *The initial idea was different [...] but [Professor x] came up with the current concept based on his industry experience [...] and then the ball started to roll. [...] The final idea was a result of an iterative process with [Industry partner] and the ideas we initially started with.* (F2)

The role of industry networks and close interaction with industry were decisive for developing the business concept that eventually became attractive for external investors. Often, the project initially benefited from discussions and interaction with a broad range of actors, as explained by one of the Delta inventors: “*We didn’t know how to engage with industry and sell them the idea. Once we got the young post doc on board he went out and looked at what was out there, started us thinking about what was better about our device.*” (F1) This is in line with prior research that emphasises the role of networks in the opportunity refinement process (Jack, 2005; Nicolaou and Birley, 2003a).

The type of network that would be most beneficiary may, however, be dependent on the type of benefit sought (Ahuja, 2000). We observed that the initial use of weak ties was important initially in the process to identify possible business models and prospective partners. One of the Gamma founders explained: “*Each medic we spoke to gave us another hurdle to jump*
over that we had no idea was there. We went away, jumped over it and then came back with positive results only to find another hurdle, another type of test or whatever.” (F2) The entrepreneurs’ networks towards industry played a pivotal role for initiating industry contacts that develop into working relationships, as noted by one of the Gamma inventors: “I knew one of my old post docs was working within industry so I rang him up and asked if he could give us some advice. He became interested and joined us, initially as a consultant, to help convince the medics that what we had was useful.” (F1)

To further specify the business model, the founders had to rely on developing existing weak ties to industrial partners and customers into stronger ties. This was clearly illustrated by one of the Delta team members: “The firm we partnered with were first introduced by the IP office. Once we had signed a partnership agreement the relationship developed over time as we worked more closely together. ...(they)... provided in kind funding in the form of manufacturing systems for prototypes and test shelters. In addition they provide advice, collaboration and time. They provide market info as we have access to their customers who would make use of this technology so we have a route to market. They gave us an insight into how companies work with customers and how the system should be changed to meet customer needs.” (T1)

It seems that weak ties are important to scan for possible solutions and strong ties are important to better refine the opportunity. This lack of market related competence appears particular to academic entrepreneurs. By contrast entrepreneurs in a more general context are more likely lacking in technological expertise. In all our cases the initial idea had to be refined several times before receiving external acceptance. To sum up, the opportunity refinement competency requires a co-evolution of network relationships with industry actors to discover opportunities based on scientific research and to further refine these opportunities into a viable business concept. Thus, we propose that:

*Proposition 1: Nascent spin-off ventures are more likely to obtain initial external investments if they gain access to opportunity refinement competency through leveraging existing weak ties with industry actors which are iteratively developed into strong ties.*
4.2. Resource acquisition

The second competency we explored related to the acquisition of resources for the new venture creation process. Due to their complexity and high demand for resources, university spin-offs are likely dependent on contributions from several actors to develop and acquire the resources they need. All our cases were developed by teams and the university or its TTO often provided access to resources. For instance, the university management stepped forward to support the Beta project both internally and externally and both Gamma and Delta received initial support from the TTO. Moreover, access to public funding sources was crucial in the initial phases of developing the nascent ventures and industry actors also provided important resources.

Similar to opportunity refinement, the use of networks was also important in accessing the resource acquisition competency. However, in the case of resource acquisition the entrepreneurs initially relied more on strong ties, as explained by one of the Alpha founders: “It would not have been possible to build this company without F4, with his network from 10 years as manager in industry. His contacts, combined with the professor titles, open doors at top manager level in the companies we approach.” (F2) Access to university resources was also partly dependent on the relationship between the academic founders and university management. The Beta founders were well respected within the university and were able to capitalize on this strong relationship, as noted by one of the new team members: “The University has shown great goodwill and been more enthusiastic than could be expected. They probably realize that this is a very exciting project that is worth to put a stake at.” (T1)

Strong network ties could also facilitate the access to public funding sources for entrepreneurs and early stage product development. In case Alpha, one of the team members possessed such relationships, as acknowledged by one of the founders: “T1 has been crucial in obtaining funds for further development, through his good contacts, broad network, and knowledge of funding possibilities.” (F4) This is in line with Ahuja (2000), who found that strong ties provided both resource-sharing and information spillover benefits, while weak ties provide only the latter. The importance of prior relations has been clearly illustrated by Shane and Stuart (2002) who found that founders of university spin-offs having prior relations to venture capitalists were more likely to receive venture funding and less likely to fail.
As the venturing process evolved, the nascent ventures needed resources from an increasing number of actors. For instance, the Beta founders initially relied on strong ties to obtain funding, but were later able to gain equity investment from more than 20 investors. The Delta founders initially relied on university support, but subsequently developed new contacts as described by one of the founders: “To attract potential partners the IP office suggested we make some commercial in confidence flyers. We disseminated these everywhere we could think of. [...] Six firms of differing sizes came to visit us and signed confidentiality agreements. We had a dialogue with a number and then one came on board as development partners. They have been absolutely fantastic.” (F2)

Thus, strong ties are important to obtain access to some initial resources, but as the credibility of the venture increases, weak ties seem to be sufficient to obtain additional resources, as noted by one of the Alpha founders: “The alliance with [Industry partner] has created a ‘domino effect’ related to other customers.” (F4)

Thus, we propose that:

Proposition 2: Nascent spin-off ventures are more likely to obtain initial external investments if they gain access to resource acquisition competency through initially leveraging existing strong ties with resource providers and subsequently through developing new weak ties with additional resource providers.

4.3. Championing

The third competency related to the personal commitment or the leadership role needed to carry on the venture start-up process. Mere opportunity recognition is not sufficient for resource allocation to occur (Danneels, 2007), there is also a need for impetus, a driving force. Our cases illustrated very clearly the important role of champions. As with the other competencies, championing was not static. The championing competence needs to be developed as the new venture matures (Clarysse and Moray, 2004). In our cases, the champion role may change from developing internal support and legitimacy within the university context to developing external support and legitimacy towards industry partners, customers, and potential investors.
Compared to other studies of championing (Howell and Shea, 2001), our definition of championing is narrower, focusing only on the driving force and not the ability to spot opportunities and get access to resources. The initial founders of the ventures relied on their strong ties to colleagues and other acquaintances to recruit the entrepreneurial team and champion the venture, as described by one of the Alpha founders: “Both me and F4 had worked on [...] systems for 10 years in industry and academia. [...]. I and F1 knew F3 from previous projects, and knew he was very efficient and an expert on software development, a competence that was important in this project. We (F2 and F4) have been working together with F1 for many years, so it was natural to include him as a team member. F1 knew a very competent business developer, T1, who was invited for the first meeting. F4 had a childhood friend who now is a business lawyer, T2, which he believes in, who also was invited for the first meeting. The chemistry among the six of us turned out to be very good.” (F2) Thus, access to such persons was facilitated by the networks of the entrepreneurs and their ability to influence others (Nahapiet and Ghoshal, 1998).

A division of championing roles may be necessary in complex, science-based start-ups (Day, 1994). Thus, academic researchers might be important champions initially, while persons with another background may be needed in a championing role in later stages, as noted by one of the Gamma founders: “We got our finance director, our marketing director, all with contacts into the industry. In a few months they wrote a new business plan and took me along to pitch it to a local VC. [...] We walked away, after a few legal meetings with half a million”. (F1)

Our cases show that an effective team is important to be able to respond to and deal with rapid changes in the business concept. The motivation and capabilities of academics to become entrepreneurs are important, particularly in the early phases of competency development. Internal bottom-up champions are crucial, but also external persons or persons higher in the organization can provide championing competency (Burgelman, 1983; Day, 1994). Alpha and Delta emphasize the important role played by ‘godfathers’. That is, influential persons in industry or other resource providers who make an additional effort to help the project. There seem to be good examples of such influential persons in all cases, such as the university managers in Beta and the experienced (surrogate) entrepreneur (Franklin et al., 2001) who become chairman of Gamma. Access to such persons is facilitated by the networks of the entrepreneurs involved in the project and their ability to influence others (Nahapiet and Ghoshal, 1998). This use of strong ties to engage champions in external organizations was
clearly explained by one of the Alpha founders: “We contacted [Industry partner 1], where I knew the top management. [...] Although we were received positively at top level in [Industry partner 1], the project got into a deadlock when it was delegated down in the organization. [...] Things seemed difficult, but I talked to [Director X] about the problem. He took action and allocated money to the project and made it attractive for the staff to work on it. [Director X] is one of our ‘godfathers’ who believed in us and took action to help in a difficult phase.” (F4) As discussed by Howell and Higgins (1990), champions induce the commitment of others to the innovation by providing emotional meaning and energy to the idea.

Access to external champions was initially built on the strong ties of the entrepreneurial team as observed by Murray (2004). As the ventures evolved this gradually changed, and new team members and external champions were mainly recruited through the use of weak ties. To move from using strong ties to using weak ties was important to broaden the competency base of the venture. Strong ties are important to get access to championing competency initially in the start-up process, but as the credibility of the venture increases, weak ties seem necessary to obtain new champions. Thus, we propose that:

**Proposition 3:** Nascent spin-off ventures are more likely to obtain initial external investments if they gain access to championing competency through initially leveraging existing strong ties with key partners and subsequently through developing existing weak ties with new partners.

**5. Discussion**

This study has keyed into a neglected part of the new venture creation process, the use of networks in the initial phases of venture development. Taking a competency perspective leads to several new insights. By focusing on competencies, this study addresses the lack of multi-level approaches in entrepreneurship research (Davidsson and Wiklund, 2001; Wright et al., 2004a). The competency approach helps to identify the specific contributions of networks to the entrepreneurial processes and to incorporate the role of a broad array of actors. Furthermore, an important contribution of this study is the dynamic insights showing how different types of networks play more or less significant roles in different phases of the venture development process. The main findings of our study are summarized in Table 4.
We contribute to research on networks and social capital (Burt, 2000; Granovetter, 1973; Jack, 2005; Nahapiet and Ghoshal, 1998) by specifying the role of different types of networks and social capital at different points in the entrepreneurial process. We propose that initially in the process, weak ties play a particularly important role for the opportunity refinement competency by facilitating opportunity recognition and development. Leveraging existing strong ties, on the other hand, contributes towards resource acquisition and championing competencies through the increased ability to acquire resources and convince other people. Later in the process, the opportunity refinement competency increasingly relies on iteratively converting weak ties with industry to stronger ties to transfer more complex knowledge and begin to exploit the technology. In contrast, as the venture grows resource acquisition and championing becomes more dependent on leveraging existing weak ties and building new weak ties to attract resource providers and key personnel. These findings may reconcile contradictory findings related to the importance of strong and weak ties. Strong ties appear important early in the start-up process (Jack, 2005), but so equally do weak ties (Greve and Salaff, 2003; Steier and Greenwood, 2000). Our study shows that these ties serve different purposes related to the need for different competencies during the start-up process.

By investigating the initial phases of venture emergence, we also shed light on where firm capabilities come from. As asserted by Teece and Pisano (1994), organizations need to renew their competency sources in order to respond to shifts in the business environment. Our investigation shows that this ability is important from the very beginning of the firm’s development. The nascent ventures needed to change the way they used networks to acquire the specific competencies required at early phases of development. The weak ties used to explore the business opportunity had to be developed into strong ties for exploiting the opportunity. In contrast, the use of strong ties used to access initial resources and champions had to be augmented by weak ties to broaden the access to these competencies.

5.1 Managerial implications

Many of the competencies needed in initial venture development can only be supported indirectly as both the competencies and the networks to access such competencies need to be
built over time. For instance, the opportunity refinement competency is dependent on industry interaction, the resource acquisition competency is related to the legitimacy of the entrepreneurial team, and the championing competency is related to individual motivations. Thus, many aspects of the competencies are difficult to address by managerial initiatives, at least in the short run.

The different nature of the three competencies implies that universities and firms cannot apply the same policies and schemes to support the development of networks to access each competency. Opportunity refinement often depends on interaction with customers or industry, while the championing competency may be related to cultural factors, prior experience, and incentives. Because opportunity refinement and championing competencies have a stronger connection to the individuals involved, the influence of managers can only be more indirect. In contrast, resource acquisition is dependent on a range of factors that can be supported more directly through networks with many different actors. Universities and support actors are well-placed to assist in accessing and acquiring resources, for instance through building networks that give access to resources. Moreover, the competency approach is highly appropriate for assessing the existing competencies of an individual or team, thus highlighting areas needing further training or additional support.

5.2 Limitations and research implications

Our study has a number of limitations that provide opportunities for further research. There is a need to replicate our analysis in other national, university, and industry settings for further validation and refinement. Larger samples and longitudinal research designs following the development of networks and competencies over time and the outcome of the process are warranted in order to test the propositions.

Since entrepreneurship is a dynamic process, theorizing on particular phases of development is justified (Shane et al., 2003). It is unlikely that one model can describe the entire process from initial idea to established venture. Thus, our model has theorized the process leading to initial investment, while other factors may influence on the further survival and growth of the venture. Whether the patterns of networking that have been identified in this study are associated with higher survival rates and superior performance needs further investigation.
Another question emerging from this study is what networks are exclusive to the start-up process and what networks are important to access the competencies needed for the further operation and development of the new firm. These questions are important because while networks may contribute with temporary competences, it is important that the more enduring competences are built within the new firm. As our cases reveal, there might be a trade-off between the degree of competency development internally in the venture and the use networks to access external competencies. This appears particularly related to the opportunity refinement and resource acquisition competencies, as championing needs to be tightly connected to the venture.

We have investigated research-based ventures emerging in a university context, but the findings may be relevant in other settings as well. The perspective is particularly useful in complex contexts where many individuals and actors are involved in developing nascent ventures with an uncertain outcome. Thus, the competency perspective could be relevant to study the use of networks during the start-up process of new technology-based firms in general, new product development processes involving several organizations or units, and processes of institutional entrepreneurship. Such analysis, will enable comparisons with the academic spin-off context to be made.

6. Conclusions

Overall, our synthesis of the competency perspective with network theory helps gain a better understanding of the role of networks in accessing the entrepreneurial competencies required to create new ventures within the non-commercial academic environment. Ventures were seen initially to develop opportunity refinement competency through leveraging weak ties to industry partners and then building stronger ties to help exploit their novel technologies. In contrast, resource acquisition and championing competencies were accessed through initially building upon strong ties to colleagues and investors and subsequently developing new weak ties to augment the entrepreneurial team and raise further investment. More generally, these insights add to our knowledge of how networks evolve by indicating that this is a non-linear process the nature of which is influenced by the particular competencies concerned.
References


Table 1. Central properties of the spin-off cases

<table>
<thead>
<tr>
<th></th>
<th>Alpha (A)</th>
<th>Beta (B)</th>
<th>Gamma (C)</th>
<th>Delta (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University context</td>
<td>Norwegian university with long history of industry collaboration</td>
<td>Norwegian university with weaker industry contacts</td>
<td>UK university</td>
<td>UK university</td>
</tr>
<tr>
<td>Founder(s)</td>
<td>Four professors</td>
<td>Two professors</td>
<td>One senior lecturer one post doc</td>
<td>Two Professors</td>
</tr>
<tr>
<td>Time from research idea to spin-off</td>
<td>~14 years</td>
<td>~8 years</td>
<td>~15 years</td>
<td>~10 years</td>
</tr>
<tr>
<td>University ownership</td>
<td>No</td>
<td>Yes, major</td>
<td>Yes, minor</td>
<td>Yes, minor</td>
</tr>
<tr>
<td>Premises</td>
<td>University incubator</td>
<td>University incubator</td>
<td>City incubator</td>
<td>University incubator</td>
</tr>
<tr>
<td>Main R&amp;D partner</td>
<td>Industry</td>
<td>University</td>
<td>University</td>
<td>Industry</td>
</tr>
<tr>
<td>Main source of idea development</td>
<td>One professor’s industrial experience</td>
<td>Professors’ prior industry cooperation</td>
<td>Post doc’s industrial experience</td>
<td>Post doc’s networking</td>
</tr>
<tr>
<td>Field of research</td>
<td>Engineering</td>
<td>Biomedical</td>
<td>Biomedical</td>
<td>Engineering</td>
</tr>
<tr>
<td>Product</td>
<td>Software</td>
<td>Medicine</td>
<td>Medical device</td>
<td>Electro-mechanical</td>
</tr>
</tbody>
</table>
Table 2. Persons interviewed (number of interviews in parenthesis)

<table>
<thead>
<tr>
<th>Team members (T)</th>
<th>Alpha (A)</th>
<th>Beta (B)</th>
<th>Gamma (C)</th>
<th>Delta (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founders (F)</td>
<td>Professor F1 (4)</td>
<td>Professor F1 (3)</td>
<td>Senior lecturer F1 (4)</td>
<td>Professor F1 (2)</td>
</tr>
<tr>
<td></td>
<td>Professor F2 (2)</td>
<td>Professor F2 (1)</td>
<td>Post doc F2 (4)</td>
<td>Professor F2 (2)</td>
</tr>
<tr>
<td>Senior lecturer</td>
<td>Professor F3 (2)</td>
<td>Professor F3 (2)</td>
<td>Professor F1 (2)</td>
<td>Professor F2 (2)</td>
</tr>
<tr>
<td>Team members (T)</td>
<td>Professor F4 (2)</td>
<td>Professor F4 (2)</td>
<td>Professor F1 (4)</td>
<td>Professor F2 (2)</td>
</tr>
<tr>
<td>Business developer</td>
<td>T1 (3)</td>
<td>Bus. developer T1 (1)</td>
<td>Researcher T1 (1)</td>
<td>Post doc T1 (2)</td>
</tr>
<tr>
<td>Lawyer T2 (1)</td>
<td>T2 (1)</td>
<td>Bus. developer T2 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team members (B)</td>
<td>Same as founders</td>
<td>Administrative support T3 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board members (B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>First Chairman B1 (1)</td>
<td>Chairman B1 (1)</td>
<td>Same as founders</td>
<td></td>
</tr>
<tr>
<td>management (U)</td>
<td>New Chairman B2 (1)</td>
<td>Finance Director B2 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department manager U1 (1)</td>
<td>University manager U1 (1)</td>
<td>Department manager U1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department manager U2 (1)</td>
<td>University manager U2 (1)</td>
<td>Department manager U1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department manager U3 (1)</td>
<td>University manager U3 (1)</td>
<td>Department manager U1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department manager U4 (1)</td>
<td>University manager U4 (1)</td>
<td>Department manager U1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>CEO science park S1 (1)</td>
<td>TTO S1 (1)</td>
<td>TTO S1 (1)</td>
<td>TTO S1 (1)</td>
</tr>
<tr>
<td>actors (S)</td>
<td>University administrator S2 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTO CEO S1 (1)</td>
<td>University administrator S3 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTO Business</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>developer S2 (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (O)</td>
<td>Informal advisor O1 (1)</td>
<td></td>
<td></td>
<td>Development partner O1 (1)</td>
</tr>
<tr>
<td>Total number of interviews*</td>
<td>16</td>
<td>16</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

*The total number of interviews may be less than the sum of persons interviewed because some interviews were done with more than one person and some persons have more than one position.
Table 3. Summary of the competency development in each case

<table>
<thead>
<tr>
<th>Case</th>
<th>Opportunity refinement</th>
<th>Resource acquisition</th>
<th>Championing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>Idea identified from professors’ industry experience. Idea refined in interactive process with several industry actors. Key industry partner invested in the spin-off and played a central role in developing the business concept.</td>
<td>The entrepreneurial team had strong networks with industry and public support actors which were used to access resources. Subsequently it became easier to attract resources from a variety of resource providers.</td>
<td>The entrepreneurial team was recruited among people the professors knew from prior work relationships. Additional champions and employees found among industry contacts and prior students.</td>
</tr>
<tr>
<td>Beta</td>
<td>Inventors learn about business through seeking advice from many industry actors. Later in the process support actors (Science park) and new team members help framing the idea into a viable business concept.</td>
<td>Strong support from the university and local actors to begin with. External investment and resources acquired when the venture had reached initial milestones.</td>
<td>Inventors had high motivation to succeed and gained much assistance among champions within the university to set up the venture. New team members were recruited among contacts established during the start-up process.</td>
</tr>
<tr>
<td>Gamma</td>
<td>Effort needed to communicate the idea to industry. Iteration to meet industry requirements. Iteration showed step change in effectiveness when researcher with industry experience joined the team.</td>
<td>Initial support from TTO. Experienced entrepreneur framed and legitimated the business model. Using his network he added credible management team to give confidence to the investors.</td>
<td>Motivated inventor. New team members with prior experience of venture growth and development joined to develop idea and business model.</td>
</tr>
<tr>
<td>Delta</td>
<td>Idea framed by active interaction with market. The idea was a solution looking for a problem. A researcher with industry contacts helped discover the unique selling point.</td>
<td>Initial support from TTO. New development partner provided business knowledge, prototyping facilities and scale up expertise.</td>
<td>Inventors believed in the technology. Post doc enjoyed being an entrepreneur. The relationship with industry partners helped develop a champion within the partner firm.</td>
</tr>
</tbody>
</table>
Table 4: Use of networks to access competencies

<table>
<thead>
<tr>
<th>Competency role</th>
<th>Opportunity refinement</th>
<th>Resource acquisition</th>
<th>Championing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key tasks throughout process</td>
<td>Opportunity recognition and further exploitation of the opportunities.</td>
<td>Accessing and combining new sources of resources (tangible and intangible).</td>
<td>Identifying with the opportunity and take responsibility of moving it forward.</td>
</tr>
<tr>
<td></td>
<td>Initial technology and market development and subsequent adaptation and refinement of the business concept.</td>
<td>Initial focus on gaining resources from familiar sources (e.g. within the university) and gradually more focus on gaining resources from external sources.</td>
<td>Initial entrepreneurial drive and gradually more professional management.</td>
</tr>
<tr>
<td>Use of networks initially in the spin-off process</td>
<td>Using weak ties to scan for possible applications of the technology and initial development of the business concept.</td>
<td>Use of strong ties to get access to initial set of resources because weak ties are generally reluctant to commit resources at early stage when the risk is perceived as high.</td>
<td>Use of strong ties to gain initial champions to help develop the venture. Connected to the founders’ personal relationships.</td>
</tr>
<tr>
<td>Quotes illustrating the use of networks initially in the spin-off process</td>
<td>“Me and [Co-founder] did a lot of work in that period, we talked to investors in Norway and abroad, and had a terrible work to find a solution [...] We lost a year in the company’s development. But on the other hand, this year [...] gave us a unique understanding of Norwegian and international investors [...] So we got many advices, and many contacts, so we came out much stronger in order to be able to develop a company, compared to if we got the patents right the way. So when Beta was established we had considerable knowledge about what existed, we had some contacts, and so on. So in this way we were able to work faster when we finally started.” (Beta F2)</td>
<td>Support from the TTO. “Once (Founder 1) explained what they had to me, I did my best to keep them going. We paid all the patent costs and persuaded the head of school to allow them to use the lab to test their prototypes, during idle periods, free of charge.” (Gamma S1)</td>
<td>In the beginning the senior lecturer gave the venture legitimacy within the school through building a relationship with other researchers and the TTO. He then delegated responsibility to his ex post doc to reconfigure the technology to meet the need of the medics, the potential customers of the device.</td>
</tr>
<tr>
<td>Use of networks later in the spin-off process</td>
<td>Some of the weak ties develop into strong ties that become the prominent partners for developing and refining the business concept.</td>
<td>Use of weak ties to get access to additional resources. Weak ties commit resources based on the perceived potential of the venture.</td>
<td>Use of weak ties to gain champions with specific skills to develop the venture further. Weak ties become champions based on the perceived potential of the venture.</td>
</tr>
<tr>
<td>Quotes illustrating the use of networks later in the spin-off process</td>
<td>‘The first idea was not right. [Industry partner] did not see any value in it. We had several rounds to better understand them from the inside so that we could adapt our ideas. The first half year was an iteration with [Industry partner]. We had numerous meeting at all levels to understand how they think. This was a heavy period, but very decisive.’ (Alpha F2)</td>
<td>‘[University Science Park] have followed this project over time, so when they saw some structure and competency coming into the company they were involved and pushed this process. So they have both contributed with funding and legitimizing the company.’ (Beta B2)</td>
<td>“T1 suggested we should try [Industry partner 2], and I had contacts there as well. We felt misunderstood by the development people in [Industry partner 2], but this time another ‘godfather’ [N.N.] believed in the project and championed it internally. […] Without the help of these ‘godfathers’ it would have been difficult to get further.” (Alpha F4)</td>
</tr>
</tbody>
</table>