

Networks and entrepreneurial learning: Coping with difficulties

Abstract

Purpose - Many scholars analyse networks and learning to understand how individuals successfully create and manage new ventures. Based on the assumption that entrepreneurs learn from networks, this study examines which types of difficulties encourage entrepreneurs to use networks to facilitate learning, whether entrepreneurs change networks to deal with such difficulties, and which network characteristics facilitate learning.

Design/methodology/approach - Networks are considered a potential source of learning, namely, the cognitive process of acquiring and structuring knowledge, creating meaning from experience and generating new solutions from existing knowledge. Through networks, entrepreneurs share information and discuss opportunities and problems. Using an innovative approach combining storytelling and network mapping, this study analyses how entrepreneurs use networks in learning. The data collected from six entrepreneurs working in knowledge-intensive sectors enables examining the learning process ensuing from the interactions between entrepreneurs and their contacts.

Findings - The findings show that entrepreneurs construct different types of networks in response to their difficulties, not in relation to products or technologies, but to learn to overcome self-crises, external threats, management and organisational issues. The findings reveal that entrepreneurs develop networks dominated by strong ties for exploitative learning and networks dominated by weak ties for explorative learning.

Originality/value - This study contributes to literature on networks and entrepreneurial learning. More specifically, the study provides evidence of learning in the context of networks, which is a relatively overlooked area in entrepreneurship literature, identifying the role of difficulties in determining the type of learning through networks and the related mechanisms.

Keywords: Learning, networks, difficulty, entrepreneurship

Paper type: Research paper

Introduction

Studies that understand how individuals successfully create and manage new ventures through networks and learning are increasingly popular in entrepreneurship literature (Hoang and Antoncic, 2003; Politis, 2005; Rae, 2005; Rae and Carswell, 2001; Ravasi and Turati, 2005; Wang and Chugh, 2014). In the process of learning, entrepreneurs involve other people including family, friends, colleagues and other business contacts. Entrepreneurs often have a limited ability to explore and exploit opportunities due to their lack of business skills and experience, entailing the need to learn to effectively penetrate markets, obtain finance and organise resources (Cardon et al., 2009; Wright et al., 2012). Struggling to overcome these difficulties may encourage entrepreneurs to find solutions through observing, interacting and communicating with others (Holcomb et al., 2009; Lave and Wenger, 1991; Rae, 2006;). Thus, entrepreneurial learning can be seen as a social process (Grippa et al., 2009; Taylor and Thorpe, 2004; Wenger, 2000) where the ability to learn is dependent on the social context (Holman et al., 1997; Lave and Wenger, 1991).

While literature argues the importance of networks in entrepreneurship (Hoang and Antoncic, 2003; Jack et al., 2010; Johannisson, 1995; Ostgaard and Birley, 1994), few studies focus on the role of networks in entrepreneurial learning (Pittaway and Cope, 2007; Rae, 2005; Romano and Secundo, 2009; Taylor and Thorpe, 2004). Extant studies explain learning as an individual process and overlook the interaction process whereby entrepreneurs engage with their networks in relation to learning (Politis, 2015). Although some studies consider how entrepreneurs use networks for learning (Bergh et al., 2011; Romano and Secundo, 2009; Taylor and Thorpe, 2004), the structure of networks and how different network characteristics may support their different way of learning is still underdeveloped.

A further issue lacking in entrepreneurial learning studies is investigating the factors that determine learning. Literature suggests that much of the learning that takes place in the context of entrepreneurship is experiential in nature (Cope and Watts, 2000; Deakins and Freel, 1998; Minniti and Bygrave, 2001; Rae, 2000). Entrepreneurial learning is situated in the daily activities of creating and managing the business (Cope, 2005). Learning is frequently unintentional rather than deliberate and occurs when entrepreneurs face difficulties during their entrepreneurial journey. This leads to learning new skills or questioning their beliefs to reframe their understanding of the situation or construct new self-beliefs (Holcomb et al., 2009; Rae, 2006). Learning thus helps entrepreneurs overcome difficulties and consequently adjust their ambition or strategies (Cope, 2005; Cope and Watts, 2000; Kayes, 2002; Kempster and Cope, 2010; Politis, 2005). Increasing our knowledge of entrepreneurial learning therefore requires understanding the complex process through which entrepreneurs learn from their difficulties.

Bringing together two areas of research - networks and entrepreneurial learning - this study addresses the following questions: 1) Which types of difficulties encourage entrepreneurs to use networks to facilitate learning? 2) Do entrepreneurs change networks to cope with difficulties? (3) What network characteristics facilitate learning to cope with difficulties?

In examining the process of learning through networks, this study moves beyond the assumption that learning is an individual process, considering the interplay between social interaction and the entrepreneur's efforts to deal with crises to overcome difficulties and barriers to growth. As such, this study forms part of emergent research on learning in the context of small firms and entrepreneurial networks (e.g., Cope, 2003; Franco and Haase, 2009; Rae and Carswell, 2001; Romano and Secundo, 2009; Sadler-Smith, 2001). A key

contribution is the development of a theoretical model and a new innovative data collection method to describe entrepreneurial learning as the process of overcoming difficulties with the support of networks. This study is also a response to calls for more research on learning as the transformation of knowledge (Politis, 2005; Wang and Chugh, 2014), examining changes in networks and the dynamic learning process that manifests in the entrepreneurship context.

The role of networks in entrepreneurial learning

Studies on entrepreneurial learning have become increasingly popular in recent years (Pittaway and Thorpe, 2012; Rae, 2006; Rae and Carswell, 2001; Wang and Chugh, 2014). Literature highlights learning as an important element of the survival and growth of small firms (Covin and Slevin, 1989; Gibb, 1997; Rae, 2005; Ravasi and Turati, 2005). Kolb (1984) defines learning as a continuous process modified by experience. Bandura's (1986) theory of social cognition considers learning as an information-processing activity while Mumford (1995) suggests that learning could be reactive, deliberate and responsive or proactive based on the level of conscious intent. Learning can also be conceptualised as a dynamic process that enables enacting entrepreneurial behaviours (Kirzner, 1973). Young and Sexton (1997) find that entrepreneurial learning is defined by the role of memory, while Deakins and Freel (1998) argue that experience generates new meaning, a change in thinking and behaviour. In some cases, learning is about solving problems and overcoming obstacles (Cope and Watts, 2000; Deakins and Freel, 1998; Franco and Haase, 2009). The role of action learning, where much of learning is experientially based, has been particularly highlighted (Rae and Carswell, 2001). It is generally postulated that entrepreneurs learn primarily through learning-by-doing, encompassing trial and error activities, problem solving and discovery (Cope and Watts, 2000; Deakins and Freel, 1998; Young and Sexton, 1997). In

going through this process, entrepreneurs learn by responding to challenges while also becoming aware of their limitations. Overall, literature seems to concur that learning is the cognitive process of acquiring and structuring knowledge, creating meaning from experience and generating new solutions from existing knowledge (Kempster and Cope, 2010; Rae and Carswell, 2001).

While these studies help in understanding how entrepreneurs learn, the role of networks in learning is still understudied. In response to calls for more studies on networks and learning, Rae (2005) analyses contextual learning through participation in community, industry and other networks whereby entrepreneurs experience learning. Taylor and Thorpe (2004) apply social concepts to identify the effect of relationships on learning. Similarly, this study considers that networks are a potential source of learning (e.g., Levitt and March, 1988; Powell et al., 1996; Uzzi, 1997) that promotes efficient skill transfer among firms (Hamel, 1991) or produces a novel syntheses of existing information (Jack et al., 2010; Powell et al., 1996). Depending on the variety of information available, entrepreneurs in some network structures learn and make better decisions than entrepreneurs in other network structures. In broader terms, this represents an important aspect of the complex, intimate and dynamic relationships that exist between entrepreneurs and others they are connected to (Gibb, 1997). While some studies focus on how entrepreneurs construct networks to solve problems (Jack et al., 2010), little is known about the nature of ties and how learning is facilitated through the creation of entrepreneurial networks.

This present study is grounded in social capital theory (Coleman, 1990; Putnam, 1995). There is wide consensus in literature that social capital is a valuable asset whose value emerges from access gained to resources through an actor's social relationships (Coleman, 1990; Granovetter, 1983; Jack, 2005; Liao and Welsch, 2005; Putnam, 1995). In explaining

social capital, scholars use network characteristics such as strong and weak ties (Elfring and Hulsink, 2003; Jack, 2005). Strong ties require fairly frequent contacts that are usually long-term, reciprocal and involve a high degree of trust and emotional closeness (Granovetter, 1983; Marsden and Campbell, 1984). Scholars such as Hansen (1999) and Jack (2005) sustain the importance of strong ties, arguing that this type of relationship benefits from the transfer of complex information. While strong ties support learning, they may constrain the search for new and novel information (Elfring and Hulsink, 2003). Entrepreneurs can gain new perspectives and insights through communication and exchanging ideas with people they do not meet very often, i.e., via weak ties. Weak ties can provide information and resources beyond what is available in a close social circle (Elfring and Hulsink, 2003; Granovetter, 1983).

By bringing perspective from networks and entrepreneurial learning in the context of knowledge-intensive start up, this study aims to understand the role played by networks in facilitating the learning process.

Research method

Our approach in examining learning is based on several seminal works that conceptualise learning as a process (Easterby-Smith et al., 1998; Mezirow, 1997). While some traditional views on entrepreneurial learning perceive this as a continuous process (Hines and Thorpe, 1995), learning is increasingly considered as essentially non-linear and discontinuous (Cope and Watts, 2000) whereby entrepreneurs learn from significant but critical events (Appelbaum and Goransson, 1997; Cope, 2003; Deakins and Freel, 1998). In line with this reasoning, Rae and Carswell (2001) find the existence of salient learning episodes where entrepreneurs describe periods of learning that have been instrumental in forming their

business approach. It has been suggested that during this process significant events stimulate learning, such as experience crises, difficulties and barriers (Cope, 2003, 2005; Deakins and Freel, 1998). Deakins and Freel (1998) support this approach arguing that learning is triggered by significant and critical events. Chell et al. (1991) use critical incident analysis to investigate the learning process in small firms.

Given the understanding that learning is the sense-making process of experiencing and overcoming difficulties, the present study examines learning through a critical incident analysis asking entrepreneurs to provide their life story experiences (Bruner, 2001). Of particular interest is the narrative of experiencing difficult situations during the process of starting a new business. In addition, this study also uses a network visualisation to build better understanding of how entrepreneurs learn from networks. Network maps also help in understanding the change in networks as a response to finding solutions (Soetanto and Jack, 2013). This combined method generates stories in the form of narrative and network mapping activities for a specific episode in an entrepreneur's life where learning took place. Understanding learning from networks may be a challenge, but overcoming difficulties by helping others can be a discursive process wherein people are able to envisage the link between their own limitations and support from others (Shotter, 1993).

Data collection

The interviews were semi-structured with questions developed in advance and used to steer the interviews. Each interview was taped, transcribed and verified by the respondents. During the interviews, a timeline map was constructed to indicate significant life events and experiences, which was subsequently used for respondents to reflect on the events more deeply. Respondents thus structured their stories around significant events in which they

recalled that changes in networks or learning had taken place. Focusing on the event by asking respondents to disclose their experiences in detail and how they made sense of these experiences led to the what, how and from whom they learned and what changes in thinking and actions occurred. To address and specify the objective of understanding the process of entrepreneurial learning through overcoming difficulties, and to consistently develop the questions, a pyramidal algorithm of interview question development was employed (Wengraf, 2001). During the story telling process, respondents were also asked to draw their networks using a network mapping technique (Schiffer and Hauck, 2010). No instructions on how to draw the network were provided. Respondents drew their connections with other contacts and thereby created their ego-type networks. During the mapping activities, asking several questions related to each network contact allowed capturing the reflection process. The overall process lasted between 3 to 4 hours (including network visualisation).

Such approach entails some challenges. The first is reducing the potential bias of memory loss. For this reason, the sample was limited to start-ups that were established less than five years ago with the aim of creating homogeneity in the types of difficulties and help respondents reflect on similar situations in starting a new venture. The second challenge relates to respondents visualising their networks and focusing on the most important contacts. Using a name generator technique (Burt, 2004), respondents created a list of contacts that influenced the event in positive and negative ways, thereafter drawing two sets of networks, those prior to (or at the time of) the event and those after the event.

Study sample

The data collection process was conducted in the period 2009 to 2010. The sample of this study includes six entrepreneurs working in knowledge-intensive start-ups closely linked to

university and commercialised technology-based ventures. These entrepreneurs were academic spin-offs from Delft University of Technology (the Netherlands) and Lancaster University (The United Kingdom). They relied heavily on support from business incubators. In selecting the sample, several factors were considered including gender, type of industry and the stage of venture development. This sample was thought to be sufficiently representative to provide an excellent opportunity to examine entrepreneurial learning in the context of knowledge-intensive start-ups. Table 1 provides a description of the entrepreneurs participating in the study.

Insert Table 1 about here

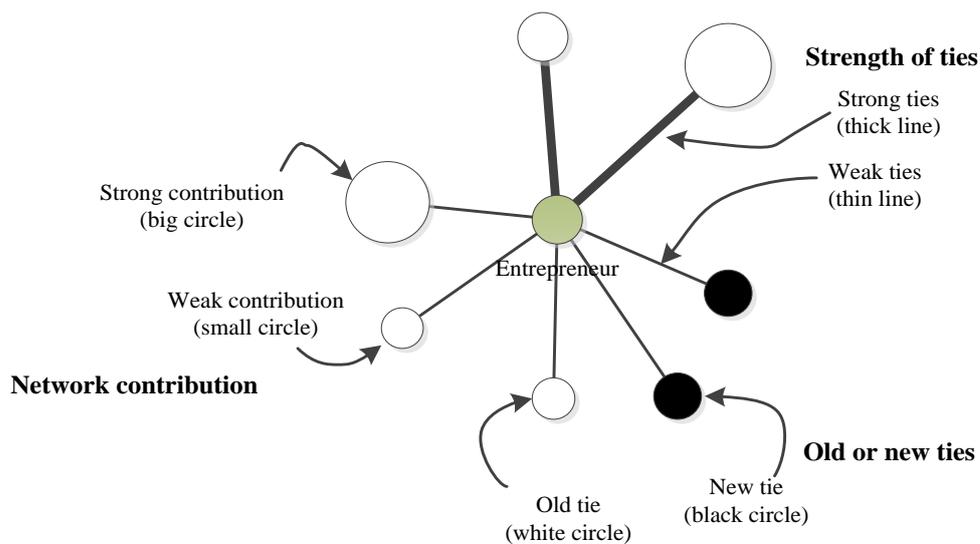
Data analysis

To understand the learning process, the interview transcripts were independently read, employing open in vivo coding using the NVIVO qualitative data analysis program. The qualitative data was also iteratively analysed by moving back and forth between the data, the network maps and the emergent structure of theoretical arguments responding to the research questions (Locke, 2001). The analysis followed a three-step qualitative research method. In the first step, a provisional category and first-order themes were created by identifying statements via open coding (Locke, 2001) drawing on common statements, expressions and opinions to form provisional categories and the first-order themes. A contact summary form (Miles and Huberman, 1994) was used to record the provisional categories emerging from the data. In the second step, the first-order themes were integrated, creating the second-order themes. This stage allowed an across-data comparison for greater abstract understanding. As

the categories were consolidated, the coding moved from open to axial (Locke, 2001). In the third step, the concept was limited by aggregating the theoretical dimensions into the third-order themes. Several alternative models were then constructed describing how these themes related to each other (Locke, 2001).

Differing in this present study is the use of network mapping as additional data not only to enrich and triangulate the narrative data but also to help the respondents to focus on their story. To analyse the changes in networks, a network template was constructed and used as a sensitizing device to understand the changes in network characteristics. The template included three objects representing the strength of ties (strong ties refer to high frequency interactions while weak ties refer to low frequency interactions), the perceived importance of the contact's contribution and whether the contacts were new or old. Figure 1 illustrates the network mapping template produced for the data collection process and the terminology used in describing the entrepreneurs' networks.

Figure 1. Template for network visualisation



Findings

Difficulties as a trigger for learning

The first research question focuses on the difficulties that influence learning. While literature on entrepreneurship is populated with studies on the problems and obstacles that entrepreneurs face, the intention of this study is to identify the types of difficulties that trigger learning and how this affects the development of networks. Interestingly, the study finds that entrepreneurs are often reluctant to use networks to deal with difficulties related to their products or technologies. In contrast, their lack of entrepreneurial knowledge and skills forces them to use networks for learning. The following discussion presents three categories of difficulties that trigger entrepreneurs to seek help and learn from their networks.

Difficulties in dealing with self-crisis

In this study sample, evidence emerged that entrepreneurs experience self-crisis difficulties during their entrepreneurial journey caused by the intrinsic nature and feelings about being entrepreneurs. Entrepreneurs are often defined as high achievers and strongly motivated (McClelland, 1965; 1987). However, in some cases, the entrepreneurial process can cause frustration (Baron, 2008). To illustrate, the two selected cases below show how the entrepreneurs confronted their beliefs that triggered their eagerness to learn how to build a better and more sustained business.

The first case is Ben's experience with his dissatisfaction of growth and achievement (Case 1). Ben started the company with strong support from the university. The early revenue came from a project commissioned by the university. As the company grew, Ben was able to hire two additional part-timers. However, Ben felt a lack of achievement and uncertainty of

the future as the company was not progressing further. Revenue was generated from sporadic contracts that caused a problem in terms of expanding the company. Ben realised that the business was not as he expected, *'I feel that the business is more like a part-time and not full-time business. I don't know what will happen to my office next month or next year if I am unable to get a client.'* The crisis that Ben experienced was triggered when two of his employees left the company as they had not perceived his ambition to grow the business. This experience affected him personally and his concept of being an entrepreneur, *'When I started my business, I may have been young and naïve. I did not realise that people depend on me.'* He had not thought seriously about the future and to succeed needed to learn how to build a real and sustainable business.

The next case illustrates John's difficulties in the transition from university life to entrepreneurial life (Case 2). Compared to the other respondents, John's background differed. He worked as a senior researcher at a university for almost 15 years. Although he always wanted to be independent and start his own business, he was afraid of making a decision until 2 years ago when he decided to commercialise his invention. John started his venture by locating a business incubator. The biggest problem John faced was the change from university employee to small business owner. He stated, *'I would never think about being alone before. In my previous life, there was always someone to help me solve problems. I had my professors and colleagues. But now ... it's different. I have no one, even my partner, she tries to help me, but she just doesn't understand.'* John acknowledged that he felt lonely and found it difficult to adapt to his new life. He admitted that he had doubts and sometimes felt regret about his decision but was committed to overcoming his limitations.

Difficulties in dealing with management and organisation

The next category of difficulties that emerged relates to lack of entrepreneurial knowledge and skills. Included in this category are obstacles related to management and organisation, which may be the most documented challenges in entrepreneurship literature. Without relevant knowledge and skills, entrepreneurs struggle to explore and exploit opportunities. The next case illustrates the difficulties an entrepreneur faced due to lack of skills (Case 3).

Despite the firm's young age, Mike's company had enjoyed relatively fast and strong growth. He started the business with his former doctoral supervisor who had a good reputation in the field. In the second year, Mike's business partner secured research funding that helped the company buy expensive research equipment and hire several research assistants. Due to his partner's reputation, Mike was also able to secure some contracts with big industrial companies. Mike explained his situation, *'Our technology is unique, it's highly complex and needs very specific knowledge. There are very few research groups in the world that are working in the development of this technology.'* However, the crisis started when the company grew and the need for managerial and organisational tasks increased. Over time, the employees seemed to grow dissatisfied with his approach and management style. Mike held a number of different roles in the organisation and tried to be involved in all business activities. Unfortunately, he lacked managerial and business knowledge and was unable to establish an efficient organisational structure and routines. His approach and the unclear job roles had created confusion and inefficiency, which led to Mike having several heated confrontations with his business partner and employees. This disagreement ended with his partner leaving the business and challenging Mike's perception of his abilities. Mike came to realise his weaknesses and was committed to learning to improve. *'My biggest problem was dealing with management. I am a scientist working with my experiments. Labs are my world. I used*

to work in situations where everything was under control, and I like to be in control. But the situation had challenged my belief .. and my confidence. I decided to learn more about management, to be more business-minded and learn the human side.'

Difficulties in dealing with external threats

This last category of difficulties in dealing with external threats includes discrepancies with other firms, changes in regulations, developing new technology, competition and so forth. These changes can weaken the routines and concepts understood by entrepreneurs, leading to increased uncertainty. This situation triggers learning when entrepreneurs cannot rely on their previous experience or knowledge (Dess and Beard, 1984). As a result, entrepreneurs may fail to accurately predict future scenario that may occur (Dickson and Weaver, 1997). The two selected cases below illustrate the obstacles experienced by the entrepreneurs in the study.

The particular situation described here occurred in the second year of Mark's company (Case 4). Mark had already won several business contracts from buyers in Italy, Greece and Spain. Unfortunately, many of those companies experienced financial difficulties, which had a huge impact on his business. During this difficult time, the production costs increased three-fold over his initial predictions. The situation worsened as he had not received payment and orders were even cancelled. As a result, Mark faced possible bankruptcy, potentially ruining his dream. This crisis was self-imposed, as Mark acknowledged that he made a very serious error and had been over-confident in his estimations. Referring to the situation, he expressed his frustration, *'It was a disaster. I didn't know what to do ... money ran out. On one occasion, I could not drive my car as I did not*

have money to buy fuel. I knew that I needed to find a solution and quickly. But, at that time, there were too many mistakes and failures.'

The next case refers to Frank's failure in dealing with regulations and obtaining funding (Case 5). As the product in question resulted from his knowledge gained while working with the university, he had to ask the university to release the intellectual property rights. In addition to this problem, Frank failed to secure funding and investments. At the same time, there was a great deal of competition from existing products as well as alternative products using different technologies. The crisis escalated, affecting his confidence and starting to influence his personal life. Frank expressed this experience as the darkest time in his life, *'I sat for hours and hours every day in my office thinking about what to do. Have I made a mistake? Of course I have ... I failed the very basic thing, I failed to get a loan. I barely knew any potential customers. I did not study the regulations. I was not prepared for marketing and sales tasks. I just rushed into this business.'*

The creation of networks for learning

This section aims to respond to the second and third research questions focusing on networks and learning. Evident from the data is that networks are used to facilitate learning. Typical statements from the interviews include, *'I can't solve my problem alone, I need help from others'*, *'without him/her, my business won't survive'*, *'I owe this guy, he taught me how to deal with investors' money'*, *'Being surrounded by other businesses has a positive impact on me.'* More specifically, the network visualisation approach in this study helped respondents identify their networks and the related changes in response to difficulties. Using the network template, interesting findings emerged with regard to the network changes resulting from

experiencing difficulties. The following section discusses the different types of network strategies in facilitating learning.

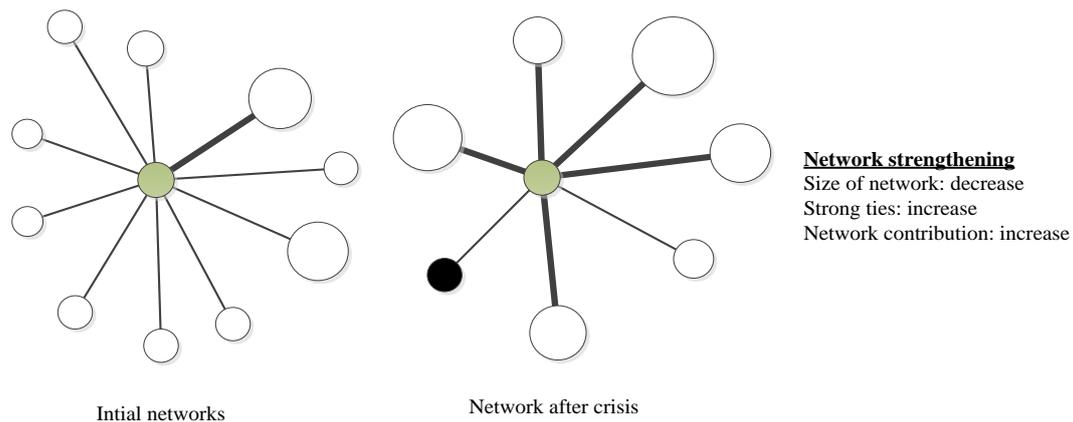
Learning by strengthening networks

During the interviews and the network mapping activity, the entrepreneurs' current networks were found to offer abundant support but they needed to focus on several network contacts offering greater resources in terms of learning. Considering several network maps, the entrepreneurs were found to strengthen their network by reducing contacts and transforming weak ties into strong ties. On several occasions, the entrepreneurs added a number of new ties but this addition was not significant. The cases below illustrate the evidence of network strengthening.

Mark (Case 4) started the company through the university's incubator program. He never felt lonely, as a sense of community had developed among start-up founders at the incubators. In describing his network during his difficulties, Mark found himself in a quite well-connected and supportive network. As shown in Figure 2, the initial network consisted of several weak ties of overseas business partners and friends at incubators. The network mapping shows that several of Mark's networks had transformed from weak to strong ties (several thick line emerged especially among overseas business partners). Mark strengthened his networks as a response to external difficulties. He acknowledged that some of the new strong ties, such as the incubator manager and several founders at the incubators, helped him redefine his strategy, providing information and knowledge on funding and investments. Mark described his learning experience as follows, *'I know that I am capable of building business, but I also confess that I was a bit ignorant and forgot to use my common sense. I may have been forced by my ambition. I also forgot to listen, especially to people with*

experience. But after reflecting back to what happened to me ... I feel that I need to have several trustable friends that I can share my problem with and learn from.'

Figure 2. Illustration of Mark's network before and after experiencing difficulties



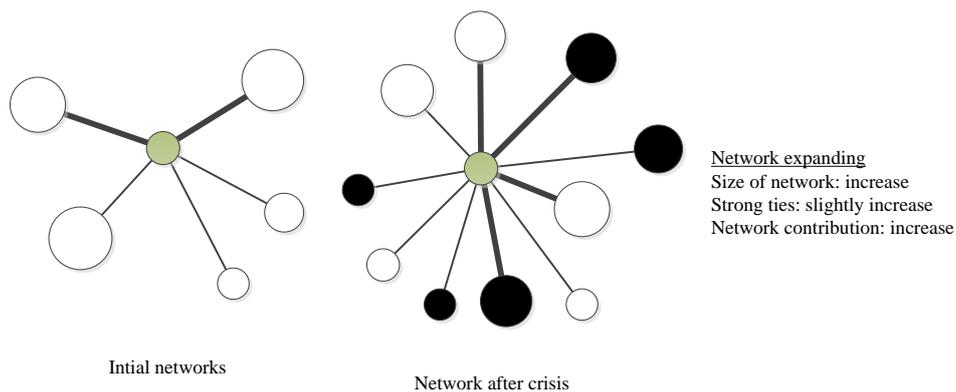
John (Case 2) developed a similar network strengthening approach. He experienced a critical moment due to his difficulty in adapting to the new environment and life of an entrepreneur. In starting the business, John felt lonely and isolated from others. However, he started to build a strong relationship with other start-ups at the incubator. He expressed the situation, *'I felt lucky. They experience similar problems like me. We became close friends and share our problems. We also learn from each other. I saw some of them even worked together to apply for grants or project.'*

Learning by expanding networks

Expanding networks by adding a significant number of new contacts and weak ties constitutes another type of learning in the present study. The entrepreneurs expanded their networks to foster new exploration and expertise from external networks.

After his partner left the company, Mike (Case 3) decided to move to a new facility and downsize his business. In the spirit of re-starting from the beginning and learning from his mistakes, Mike decided to grow his network by including professionals such as consultants and lawyers. In addition, Mike joined a business networking group and diligently meet other business owners. Most of the help came from owners of other small businesses located in same premises (business incubator). Explaining his new networks, *‘I realise that I need to listen and learn from them. They came here earlier than me, experience the same problems, face the same obstacles. So I benefited from being here.’* To illustrate the transition of Mike’s network, Figure 3 shows the difference between the initial network and the network after experiencing difficulties. In the initial network, Mike was surrounded by mainly university contacts. He relied heavily on his business partners to deal with external tasks. In contrast, the network after the crisis shows a considerable number of new contacts.

Figure 3. Illustration of Mike’ network before and after experiencing difficulties

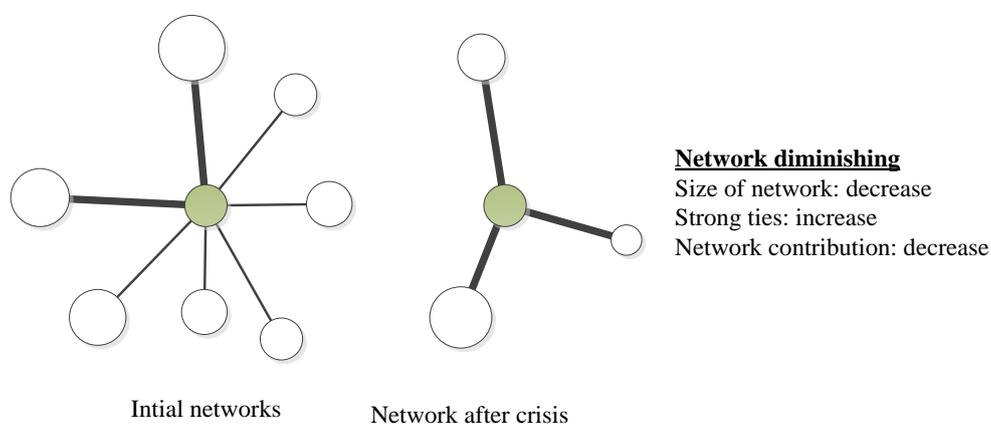


Learning by condensing networks

In this type of learning, the networks were condensed by significantly reducing the number of contacts and focusing on a few but strong and trustworthy ties. The example below illustrates the learning process through reducing the number of contacts.

On experiencing obstacles, Frank (Case 5) found support from his family and close friends. The conversations were not always related to business but helped build his confidence. The main support and source of learning actually came from his father. Frank's father is a farmer and runs a butcher's shop. *'He didn't teach me anything ... but everything became clear to me after my business collapsed. I've been observing him since I was a kid. I know how hard he works, his persistence and his willingness to sacrifice for the business. It took me a while to reflect on my experience and learn from my father. The process surprised me.'* Frank learnt that being persistent and having a vision is important for the business. He also learnt about strategy, routines and decision-making. After several months, Frank was ready to start again. In his new business, he planned to develop an interactive mobile app serving the supply chain network of the farming industry. Looking at the change in his networks, a huge decline in the number of contacts is evident. Although Frank started building a new network, the main source of learning was from family and close friends.

Figure 4. Illustration of John's network before and after experiencing difficulties

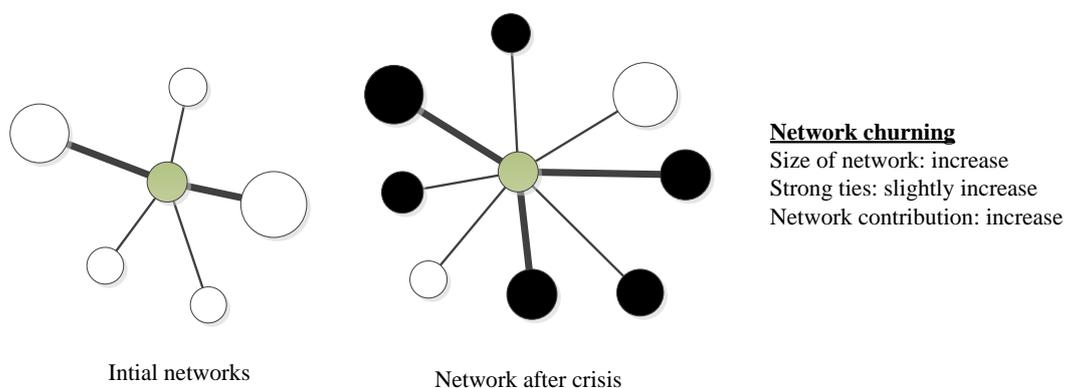


Learning by creating new networks

The last type of network development is learning through creating new networks. The entrepreneurs rebuilt their network by introducing many new contacts and replacing existent ones. Such a significant change of network arises when the current network is no longer relevant to the new challenge. The following case provides evidence of entrepreneurs creating new networks.

To solve the difficulties in dealing with slow growth, Ben (Case 1) created a new partnership, thereby introducing him to a new network. He also transformed the business by approaching the international market through opening a new training centre and using new software. As a result, Ben came across a number of opportunities and applications for his product in several different industries. Ben described the moment as a turning point and vision for the business, *'It was seminal. That was the first time in my life that I really realised the potential of my skill, my expertise and my dream. However, there was also a big risk in taking this step. But to see that I could expand my business was so fascinating.'* Ben's case shows that the network changed radically to changes in his business approach. Figure 5 illustrates Ben's network after the crisis with many new and stronger ties.

Figure 5. Illustration of Ben's network after experiencing difficulties



Learning in networks

To understand the process of learning in networks, the interviews began by asking about the contribution of each contact in the respondent's network. Further questions were asked to collect more details and refine the data on type of interactions and how respondents used their networks to question their own understanding and solve their difficulties. This process created a narrative of how the respondents interacted, reflected and built new understanding or knowledge from their networks.

Respondents used the relationship with their contacts as a catalyst for learning, which later produced evidence of critical reflection. One of the entrepreneurs stated, *'I don't feel that I am alone. Having them in the same building was super fun. I acquired so much knowledge just by observing them .. even got something from their success or failure'* (Piet). Evidence of learning can also be seen from a statement referring to the role of the incubator manager, *'She always challenges me .. not about right or wrong, but it makes me think whether I make a wise decision. We had many discussions, most of the time I disagreed with her. But again, she proved that she has a different perspective in seeing things and she is right'* (Mike). Acknowledging that he was wrong on several occasions triggered this learning process. From the interviews, several incidences emerged where critical reflection resulted from interactions with the network. As an example, *'I used to believe that being an entrepreneur, you have your own freedom .. to do anything that you want. In fact, it's quite the opposite. I still need to follow the rules, norms and culture of the business. These people help me understand my business, evaluate my objectives and make me think about the real meaning of it'* (Ben).

The study found that as a result of learning, the entrepreneurs made a change in strategy. John learnt the skill of approaching and persuading customers, *'I have learnt a lot*

from my new contacts, I have learnt how to deal with the fast changing business of my clients. I changed my approach, I listen to them and then adapt to the situation. I am now trying to fit in and absorb the changes' (John). Another example is 'I have been taught to calculate risk and used many parameters before making decision. But in this business, I should consider many things, including my feeling. ... managing risk is a skill that I can learn but also like art that I need to appreciate... Risk is a part of business' (Frank). In many cases, the learning experience was engendered by the pressure of difficulties that encouraged the entrepreneurs to adjust their growth ambition. In evidence of this change, 'The discussion we had gave me a huge motivation to keep on working' (Mike). Increases in self-confidence and self-efficacy were also witnessed, 'This guy changed me. I felt that I was confident enough before starting my business, but knowing him .. and getting support from him was a big boost in my belief' (John).

Overall, the study shows that learning in networks can be explained by the presence of critical reflection and changes in strategy. Through critical reflection, learning can fundamentally change an individual's concept, theory and actions, thereby creating entirely new strategies. As Mezirow (1990) states, critical reflection is not concerned with the how or the how-to action but with the why, the reasons for consequences of what people do. For instance, in the case of Mike when confronted by his employee, not undertaking critical reflection could have led to him sacking the employee. Instead, Mike acknowledged that the major conflict could not be easily resolved and accepted his limitations. Further evidence of critical reflection is Piet's experience. As he thought he had failed, Piet's self-belief was destroyed but he was able to build new confidence with his family's support. Both situations experienced by Mike and Piet indicate the presence of critical reflection as part of learning.

The network learning model

In developing networks for learning, this study investigates the network characteristics that facilitate learning, focusing on the role of strong and weak ties as well as old and new contacts. In learning through strengthening networks, the entrepreneurs strengthened their ties by meeting more frequently. At the same time, trust was developed and facilitated the transformation of more refined knowledge and information. As Table 2 shows, the strength of ties is relatively high and the presence of old ties is significantly higher than new ties. Evidence was also found that the entrepreneurs benefited from strong ties. In terms of learning by condensing networks, similar findings emerged when the number of strong ties dominated the process of learning from networks. These ties tend to include family, friends and colleagues who help entrepreneurs during their difficult time.

Insert Table 2 about here

Moreover, a contrasting finding is that for learning by expanding and creating new networks, the strength of ties is relatively low. The evidence indicates that entrepreneurs expand their network by adding a significant number of new ties. Although the number of weak ties increased, the entrepreneurs maintained their relationships with old ties. The last network pattern is dominated by weak ties. However, the number of old ties decreased significantly while the number of new ties increased. Overall, this finding shows that both strong and weak ties play a significant role in supporting learning.

This section discusses the relationship between strength of ties and the types of difficulties experienced by the entrepreneurs. Entrepreneurs seek additional information in an attempt to reduce or manage their difficulties. New partners in their network offer an

important source of new knowledge and information. New partners broaden the scope of their abilities, increasing the likelihood of obtaining new information and adding to the diversity of information to which they are exposed. Considering entrepreneurial networks as a knowledge base to be tapped, entrepreneurs expand this knowledge base by forming new relationships with new partners. This is an exploration response, focused on gathering new information from new network contacts.

Literature on networks also suggests that new partners are likely to represent relatively weak ties. Weak ties are beneficial as they are conduits to new, unique information which are important in knowledge exploration (Granovetter, 1983). Thus, entrepreneurs are likely to seek out such ties when experiencing difficulties, as this resource may be useful in addressing issues that the firm has been unable to effectively resolve with existing resources. Typical difficulties that entrepreneurs face and that weak tie can help resolve are their unique capabilities but also the limitation of such capabilities. Entrepreneurs may face personal difficulties arising from their lack of knowledge, skills and experience. Management and organisation difficulties may create the need for a unique resource deriving from new and relatively weak ties. Obstacles may also relate to technical and production issues caused by the firm's current situation. Firm-related obstacles are unique and specific. To solve problems and learn in this context, the empirical findings show that entrepreneurs diversified their networks in their effort to explore alternatives for solution. By utilizing weak ties, entrepreneurs gathered new information or resources that aided them during the learning process. Weak ties increase the likelihood of solving personal and firm difficulties by adding diversity of knowledge. Novel information from weak ties may be useful in addressing those difficulties that entrepreneurs were unable to address before. Thus, the study proposes:

***Proposition 1.** Networks dominated by weak ties are effective in facilitating explorative learning elicited by difficulties in dealing with management, organisation and entrepreneurs' self-crisis.*

Entrepreneurs cannot control external difficulties. Difficulties in this category refer to changes in market competition, technology development, new regulations or other environmental factors. Changing demand and customer preferences can also become a source of external difficulties. Entrepreneurs may also find it difficult to control personal difficulties, as uncertainty, loneliness and long-term pressure cannot be eliminated entirely. These personal difficulties have emotional implications and may also influence motivation and self-belief. Under this condition, entrepreneurs are likely to respond by exploiting, strengthening and focusing on their current and strong ties in the effort to exploit existing capabilities. Podolny (1994) argues that interacting with past and current contacts is the best strategy when uncertainty is high and assessing the quality of new contacts is difficult. In this case, entrepreneurs may learn effectively through contacts sharing similar ideals and values (Burt, 2004; Deakins and Freel, 1998). For instance, entrepreneurs experiencing market difficulties will seek stability and trust in relationships, which is more likely to occur in existing partner relationships than in new (uncertain) relationships (Hansen, 1999). It is commonly accepted that when the source of obstacles is unknown, individuals will tend to form relationships with others who share similar ideas and values. This banding-together of similar and familiar others may represent the common human behaviour of striving for homogeneity (Hogg and Terr, 2000). The present study finds that the entrepreneurs reinforced their existing ties, maintaining their current ties but with greater commitment. When faced with external obstacles, entrepreneurs seek stability and trust in their network, which is more likely to

occur in existing than in new relationships (Hansen, 1999). Relationships with strong ties, such as family, friends and colleagues, help entrepreneurs by providing a means of exchanging tacit knowledge, trust and comfort and facilitate exploitative learning experience. For this reason, this study proposes:

***Proposition 2.** Networks dominated by strong ties are effective in facilitating exploitative learning elicited by difficulties in dealing with external threats and entrepreneurs' self-crisis.*

Conclusions

Although theory on entrepreneurial learning is still under-developed, there is growing interest in entrepreneurs learning in difficult times in the small business context (Cope, 2005). Entrepreneurs are commonly portrayed as those with the ability to singlehandedly organise resources to explore and exploit opportunities (Brockhaus, 1980, Cooper, 1973; Delmar and Davidsson, 2000; Ireland and Webb, 2007; McClelland, 1965, 1987). Indeed, in starting a new business, most entrepreneurs face difficulties and challenges (Brüderl and Schussler, 1990; Ireland and Webb, 2007). Although nascent entrepreneurs know they will encounter difficulties, they sometimes underestimate the impact of situations entailing pressure and feeling distant from resolving the issues (Brüderl and Preisendörfer, 1998; Downing, 2005; Franco and Haase, 2009).

Based on Bandura's (1986) social cognitive theory, this study sees the process of solving difficulties as a learning process in a social context where people learn from each others. The interaction between entrepreneurs and their social environment creates a reciprocal process including cognition, behaviour, environmental influences and personal factors (Bandura, 1986). By interacting with others, entrepreneurs draw on their

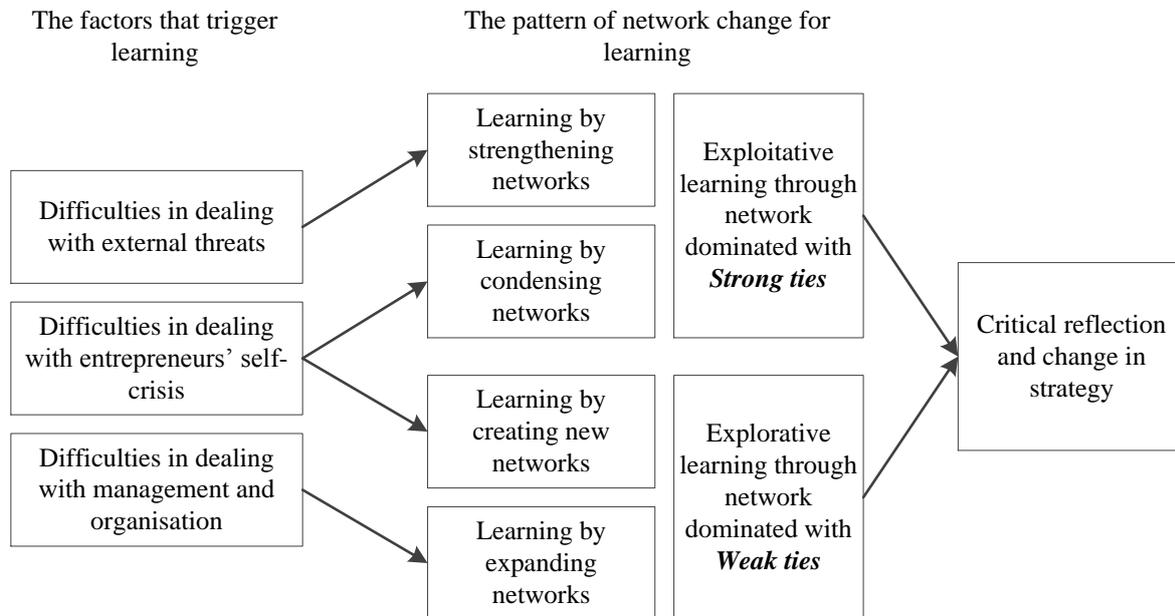
consciousness as they deal with difficulties, and this consciousness can gradually change as they receive information or knowledge from their networks. The present study finds that the context, such as interactions with the network, plays a significant role in learning. The case studies illustrate that the entrepreneurs' experiences with their networks affect the learning process. This study shows that learning through networks can also produce a higher-order learning or transformative learning, as Mezirow (1990, 1997) suggests.

Synthesis of the study findings

To summarize, the study confirms previous findings (e.g., Cope and Watts, 2000; Deakins and Freel, 1998; Sullivan, 2000) that learning can result from critical events such as experiencing difficulties. This study proposed a model of entrepreneurial learning through networks (figure 6). Four network learning models that entrepreneurs develop to facilitate learning are presented here. In these case studies, the entrepreneurs responded to difficulties by strengthening, expanding, condensing and creating new networks for learning. Examining the network characteristics, evidence emerged that entrepreneurs tended to rely on their exploitative learning using strong ties in dealing with difficulties caused by external threats. External threats led the entrepreneurs closer to their close and trusted contacts, such as long-term business partners, family and friends. In contrast, in responding to internal crises, such as difficulties in dealing with management and organisation, the entrepreneurs adapted their networks by inviting new ties and developing weak ties for explorative learning. These ties offered greater resources and capabilities allowing the entrepreneurs to learn new skills or acquire new knowledge. In solving personal difficulties, such as a self-identity crisis, experiencing loneliness and dealing with uncertainty, the findings show a rather mixed pattern where entrepreneurs used both strong and weak ties as sources of learning. It would

seem that the combination of family, friends and new contacts helped entrepreneurs deal with their difficulties.

Figure 6. Networks and entrepreneurial learning



Implication for theory and practice

This study makes a number of important empirically-grounded contributions. First, prior research has established the role of critical events, such as experiencing difficulties, as triggers for learning (Cope, 2003). This concept is here extended by considering the support entrepreneurs received from their networks. A significant contribution is in examining the process of how interactions are used to facilitate learning and finding solutions to problems. Second, previous studies have focused on the learning process as a personal reflective process (Cope, 2003), yet scant empirical evidence exists on how learning can be associated with networks (Cope, 2003). This study addresses this gap in literature by analysing the networks that entrepreneurs use to solve their difficulties. More importantly, this study expands on the position of networks in entrepreneurial learning literature by identifying four potential

network learning scenarios. Lastly, the study offers a new approach to studying networks and learning. The innovative method of combining critical incidence analysis and network visualisation provides rich yet refined data that enables studying the interactions between entrepreneurs and their networks.

The implications of this research for practices can be manifested in the form of networking support for entrepreneurs. One practical recommendation is to encourage those responsible for mentoring entrepreneurs to strengthen and equip entrepreneurs with networking capability. Support programmes commonly offered by business incubators can be tailored to identify networks contacts that can be beneficial for entrepreneurs. The implementation of ICT in strengthening entrepreneurial networks and their managerial skills could also be considered (Secundo and Passiante, 2007). Another recommendation is to encourage entrepreneurs to use network-mapping technique as a tool to help them build strategic entrepreneurial networks.

Limitations and future research

This study has several limitations that also represent a future research avenue. The findings could to be tested on bigger samples to enable generalising the results to other contexts such as less knowledge-intensive sectors. In addition, the authors encourage the construction of new samples that include additional variables and themes such as gender, team and type of industry, as well as testing the approach (visualisation and network mapping activity) in different entrepreneurship contexts.

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Table 1. Description of the entrepreneurs in this study

Entrepreneur	Description	Age	Type of industry
Ben	Ben had recently graduated from university when he started the business. Together with a friend, he set up a small office in a business development centre offering a consultancy service using their expertise on mathematical modelling methods. Revenue was generated from several consultancy projects commissioned by the university, industry and government.	25	Construction and mechanical engineering
John	Before starting the venture, John worked in a research institute for 15 years. He had extensive research experience in sound technology. The decision to start a business derived from closing his research unit. John's first project was developing a hearing protection system.	41	Manufacturing
Mike	Mike is the owner of a small biotechnology company that specialised in developing a novel enzyme technology. After 6 years of research at the university, Mike decided to establish a start-up.	29	Biotechnology
Piet	After receiving a PhD in mechanical engineering, Piet had worked for several years a postdoctoral researcher. He started a company to develop a new method to increase vehicle efficiency by combining his knowledge of mechanical engineering and design technology.	30	Mechanical engineering
Mark	Mark was studying at university to become an industrial designer when he developed several ideas on innovative decoration products. He started the company with two friends. His first product was designed and built using access to the university workshop and support from academics.	23	Design product
Frank	Frank worked as researcher and lecturer at the university when he developed software for disabled people using new speech recognition technology. He was also involved in several European projects to disseminate his technology. As a result, Frank wrote a business plan and received funding to build a prototype.	32	Information technology

Table 2. Change of networks as learning

	Supporting cases from 6 entrepreneurs	Strength of ties Mean/SD	Old ties Mean/SD	New ties Mean/SD	Perceived contribution - Excerpt from the interview
Learning by strengthening networks	4 supporting cases	4.23 (2.67)	4.95 (3.01)	0.81 (0.32)	<i>'I used to meet him every month, but after the crisis, I talked with him more often. He helped me to stay in business'</i> (John)
Learning by condensing networks	5 supporting cases	3.25 (1.99)	2.48 (1.53)	0.98 (0.57)	<i>'Learning from him meant that I needed to be with him. He taught me new skills, it was painful but worth it'</i> (Frank)
Learning by expanding networks	5 supporting cases	1.53 (0.72)	2.72 (1.34)	2.87 (1.47)	<i>'This guy was important. None of my employees knew how to solve the problem. We needed someone with a different set of knowledge of hybrid engine control systems'</i> (Mike)
Learning by creating new networks	4 supporting cases	2.40 (1.05)	1.23 (0.89)	4.35 (2.51)	<i>'These new friends helped me adapt to a new situation and challenges in the business. Their perception and approach to business are different to mine'</i> (Ben)

Notes: For each network contact, information on the strength of ties was collected. The variable was measured with a Likert-scale from 1 to 5 indicating how close the relationship is between the respondents and their contacts. Their responses were also validated by asking a question on the frequency of face-to-face interactions.