

**THE ROLE OF SOCIAL NETWORKS IN FINANCING HIGH  
TECHNOLOGY NEW VENTURES: AN EMPIRICAL EXPLORATION**

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# **The Role of Social Networks in Financing High Technology New Ventures: An Empirical Exploration**

## **ABSTRACT**

This paper focuses on the role of networks in financing high technology start-ups. We claim that the role of networks is twofold. On the one hand networks are important because network contacts can give direct access to resources. On the other hand, networks are important because being affiliated with prominent partners can send important information signals to financial resource providers. In this paper we focus in particular on a special type of signal, being the referral. The dual role of networks is studied in four high technology start-ups using a social systems approach. Our results show that start-ups in early development stages that have little experience and knowledge more often use referrals in accessing financial resource providers. They seem to profit from a network rich in structural holes and many strong connections in getting financed. Added to these findings, we found that strong ties are more often activated as a referral source than weak ties. On the other hand, the more experienced entrepreneurs/start-ups in latter development stages access financial resource providers more direct without using referrals. They seem to profit from a network rich in structural holes combined with many weak ties.

## **INTRODUCTION**

The uncertainty and lack of information that surrounds new ventures complicates the acquisition of resources needed to build and grow ventures. Stinchcombe (1965) refers to these complications as 'the liability of newness'. The specific focus we apply in this paper is on the acquisition of financial resources. We argue that social networks play an important role in new venture financing. The role of networks in financing new ventures is twofold. On the one hand networks are important because network partners can directly provide resources to the firms (direct network effect). For example many entrepreneurs acquire substantial financial resources through direct relations with friends or family. However, networks are also important in a second way because being affiliated with (prominent) partners can be an important information signal to financial resource providers (indirect network effect). In this paper we predominantly interested in a special type of indirect network effect, namely when a (prominent) partner acts as a referral source to financial resource providers

In this paper we research the dual role of networks from the perspective of the new venture. We research which relational and positional network characteristics are most effective for getting financing. This approach is twofold. First we research how new venture get access to financial resource providers. Second, in order two research our second network effect, we also research how prominent partners in general are found and accessed. Subsequently we research how the prominent network partners play a role in the financial resource acquisition process, primary by focusing on referral mechanisms. In our research the 4S model is our central theoretical framework. This multi dimensional process model of firm development is well suited to study networks in an entrepreneurial setting. Based on this model propositions are shaped and tested through case studies using a sample of four high technology start-ups.

Our results show that more experienced entrepreneurs/start-ups in latter development stages don't use explicit referrals in accessing financial resource providers. They seem to profit from a network rich in structural holes combined with many weak ties. On the other hand, start-ups in early development stages that have little experience and knowledge more often depend on referrals in accessing financial resource providers. They seem to profit from a network rich in structural holes and many strong connections in getting financed.

## **LITERATURE REVIEW**

### **Networks in Entrepreneurship**

In previous entrepreneurship studies researchers put much effort in researching the effects of network ties on the behaviour of both individuals and organizations (Adler & Kwon, 2002; Aldrich and Zimmer, 1986; Birley, 1985; Burt, 1982, 1992, 1997, 1999, 2000, 2005; Coleman, 1972, 1988, 1990; Elfring, Scholten, Kemp, & Omta, 2002; Florin, Lubatkin, & Schulze, 2003; Granovetter, 1973, 1985, 1992; Groen, 1994, 2000, 2003, 2005; Groen et al., 2001, 2002; Groen, Jenniskens, & van der Sijde, 2005; Gulati, 1998; Harveston, Wakkee, van der Sijde, & Groen, 2004; Hite & Hesterly, 2001; Hulsink & Elfring, 2003; Kirwan, van der Sijde & Groen, 2005; Klein Woolthuis and During, 1997; Klein Woolthuis, 1999; Klein Woolthuis, Groen & During, 2001; Mitchell, 1969; Nahapiet & Ghoshal, 1998; Powell, 1990; Powell & Smith-Doerr, 2003; Rowley, Behrens, & Krackhardt, 2000; Stinchcombe, 1965; Uzzi, 1997, 1999; van der Veen & Wakkee, 2004). Researchers in the past have provided mixed results in defining optimal network positions and relations. For example Burt (1992) claims that individuals and teams that are embedded in sparsely connected networks enjoy efficiency and brokerage advantages because of non-redundant information exchanges. On the other hand, Coleman (1990) argues that dense connections between members of a network lead to cooperative behaviour, which provides many advantages over sparsely connected networks. Other researchers who apply a more relational network approach claim that a mix of weak and strong ties is the optimal configuration. For example Uzzi (1997, 1999) states that the ideal network includes a mix of strong and weak ties. A relational governance of strong ties promotes the development of trust, the transfer of fine-grained information and tacit knowledge, whereas weak ties increase diversity and may provide access to new information and opportunities (Granovetter, 1973, 1985, 1992). Researchers specifically focusing on business start-up networks claim that the optimal relational and positional characteristics of the start-up network are dependent on the specific organizational process (Hulsink & Elfring, 2003) the life cycle stage a start-up is in (Hite & Hesterly, 2001) and the type of technology that is being commercialized (Groen, 1994, 2000, 2005)

### **Networks and Resource Acquisition**

Closer to the subject of our study, there is research conducted that focuses on the role of networks on resource acquisition at new ventures. Resource acquisition is one of the key processes of entrepreneurship (Greene, Brush & Hart, 1999; Hulsink & Elfring, 2003). Researchers have made claims on the range of resources a new venture needs, however our research model will come up with its own classification of resources. Many researchers focus on the role and importance of networks in the acquisition of the wide range of resources (Jenssen, 2001; Jenssen & Koenig, 2002; Larson, 1992; Starr & Macmillan, 1990; Uzzi, 1997, 1999; Wilson and Appiah-Kubi;

2002; Zhang, Wong, & Soh, 2003). For example the results of Jensen and Koenig (2002) indicate that weak ties are important channels for information, strong ties are important for motivation issues and that a mix of strong and weak ties give access to finance.

### **Financing through Networks**

Many researchers focus on the options that entrepreneurs have in financing their ventures and their consequences for success. For example Bates (1997) finds that entrepreneurs prefer to rely on family wealth and loans and Colombo and Grill (2005) found that start-ups that received private external equity financing have greater start-up sizes. Next to studies from an entrepreneur oriented perspective, a huge part of literature is conducted from an investor's perspective (i.e. Fried & Hisrich, 1994; Gupta & Sapienza, 1992; Hall & Hofer, 1993; Maula, Autio & Murray, 2005; Zacharakis & Meyer, 1998). Researchers in this stream of literature mainly focus on the psychology and decision criteria of financial resource providers. In our study we have a specific focus on the role of social networks in new venture financing. In the current literature, some examples of researchers that focus on the direct effect of networks in financing can be found. For example Chang (2004) shows that more successful start-ups have larger networks and have ties to prominent venture capitalists and partners. Zhao and Aram (1995) show that entrepreneurs who are more active in 'networking' are more successful.

### **Networks as a Status/Referral Source for Financing**

Next to the direct provision of resources by network partners, we also focus on a second network effect in the provision of financial resources. The assumption underlying this second network effect is that being related to prominent partners increases the status of a new venture and therefore decreases the uncertainty as perceived by financial resource providers. Applications of the status concept in entrepreneurship studies is limited (Washington and Zajac, 2005), however applications of the concept can be found in related fields. Researchers in these fields do recognize the value of a more sociological approach to markets and competition (Burt, 1982, 1992, 1997, 1999, 2000, 2005; Granovetter, 1973, 1985, 1992; Parsons & Smelser, 1956; Rangan Insead, 2000; Simon, 1976; Uzzi, 1997, 1999). In management and organization literature, we found several definitions of status (Perrow, 1961; Podolny, 1993, 2001; Weber, 1922). In all definitions the role of networks is recognized. Researchers who research the role of networks in the status building process come up with relatively general assumptions on the effects of networks on status. One of these fundamental assumptions on status is that status 'flows' through network ties (Lai, Lin, & Leung, 1998; Lin, 1999; Benjamin & Podolny, 1999).

The status concept as introduced in the previous section allows us to introduce the second effect of networks on the acquisition of financial resources, labeled as the indirect network effect. The indirect network effect can be described as an increase in strategic capital (status) through social networking (links to prominent players) which enables the firm to acquire economic resources more easily. There are some studies that focus on indirect network effects in new venture financing. These researchers mainly focus on the role of status, reputation, referrals and endorsements in financing. For example Shane and Cable (2002) claim that the networks are important to new venture financing because they transfer information and therefore decrease the

perceived uncertainty of resource providers. Stuart et al. (1999) focused on the referral network effect by studying the effects of endorsement on the performance of biotechnology start-ups. They show that privately held biotech firms having prominent strategic alliance partners and organizational equity investors go to IPO faster and earn greater valuations than firms that lack these connections.

In his paper we focus in depth on one type of an indirect network effect, being the referral. We assume that a connection with a high status partner is most favorable when the partner acts as an explicit referral source for the new venture. In literature there are some studies conducted that focus on referrals and new ventures. One interesting finding can be found in Aram (1989); he claims that informal investors prefer referrals of business service professional over referrals of friends. Another finding is that endorsements of high partners are particularly valuable in areas in which the high status affiliates are perceived to have expertise (Baum, Calabrese, & Silverman, 2000; Goode, 1978; Reuber & Fischer, 2005; Stuart, Hong, & Hybels, 1999). This last finding implies that there are interaction effects that determine the effectiveness of social capital. Related to this finding, Fried and Hisrich (1994) found that although many VC financing proposals come without introduction, most funded business proposals come by referral. In our literature review we found that very little studies explicitly focus on positional and relational network characteristics and referrals. Two of the few studies that do so are the ones of Batjargal (2005) and Batjargal & Liu (2004). In these studies support was found that strong ties between the new venture, venture capitalist and the referral source have favorable effects for the venture in getting funded.

### **What do we need?**

The literature review provides some insight in the relevant literature for answering our research question. However some gaps and shortcomings can be identified. Most research applying a network approach focuses on direct network effects. However there is still much work to be done in searching for contingencies that determine the effectiveness and value of certain network characteristics. (Higgins & Gulati, 2003, 2006; Leenders & Gabbey, 1999; Shane & Stuart, 2002). The second network effect, the indirect effect of networks, is studied less extensively. The specific positional and relational network configurations that lead to for example an optimal status/referral effect of networks are poorly studied. More research on this indirect network effect will provide a more complete understanding of the role networks play.

The research model we apply should therefore meet several requirements. First the model should provide a base to study direct and indirect network effects. Second it should provide a theoretical base to check the contingencies that play a role. Third, since we focus on financing issues over time, it must be suited to apply a longitudinal process oriented approach. In the next section we explain how our model can meet these requirements.

## **RESEARCH MODEL**

### **4S Model**

Entrepreneurship is a field that still lacks coherent frameworks which enable multidimensional and multi level analysis of the phenomenon (Davidsson, 2004; Shane & Venkatamaran, 2000; Van der Veen & Wakkee, 2004). In order to overcome

the lack of a central framework, the 4S framework is developed by Groen (1994, 2000, 2005) in order to provide a theoretical foundation to research entrepreneurship. The origins of the 4S model lie in the work of the functionalist sociologist Talcott Parsons (1937, 1964, 1977). Parsons claimed that in every social system four mechanisms can be identified. (1) In every social system there is here is interaction between actors who (2) strive for goal attainment. (3) Additionally, these interacting actors try to optimize their processes. However, (4) in order to make interaction possible, there have to be some common patterns of culturally structured and shared symbols. The central hypothesis is that in order for a social system to survive (so as well for a new venture); the social system has to have sufficient performance on all of these four mechanisms. The 4S model is the central theoretical framework that we apply in this paper in order to study entrepreneurial processes. Entrepreneurial processes are defined in this context as processes in which an entrepreneur sees a business opportunity, develops it into a business concept and brings it into exploitation (Groen, 1994, 2000, 2005).

Groen has translated the four basic mechanisms of a social system to an entrepreneurial context, resulting in four dimensions and related capitals of the 4S model. The central hypothesis of the 4S model is that a company needs 'sufficient' capital on the four dimensions in order to survive. In short, this means a company needs four different capitals namely strategic, economic, cultural and social capital. Strategic capital refers to the goal attainment dimension, economic capital to the optimization of processes dimension, cultural capital to the pattern maintenance dimension and social capital to the interaction dimension. The 4S model provides a theoretical foundation for studying entrepreneurship in a systematic way and provide a valuable framework in order to position research and shape research questions. An important remark on the four dimensions is that they do not exist in isolation. The four dimensions interact through the social network dimension. This interaction between dimensions allows a dynamic analysis of the four dimensions. For a more extensive outline of the 4S framework and examples of studies and research questions following from the framework we refer to Groen (2005).

We now show how the 4S model can be used in researching the direct and indirect effects of social networks in new venture financing. In doing so, we divide the effect of networks in several subsequent sub processes which can be studied separately. The following figure provides a guide in order to explain the different sub processes.

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In the figure three actors are visualized. These three actors all bring their four capitals of the 4S model in interaction through the social network dimension. By visualizing the four capitals for all actors we get a good overview of the complexity and different factors that influence the acquisition of financial resources in new ventures.

The figure can provide a good framework in order to explain the relevant sub processes in answering the research question. The starting point for of the financial resource acquisition process is a start-up identifying and connecting to financial resource providers. The origin of this tie can be diverse. Start-up entrepreneurs can for

example bring financial resource providers to the firm through previous jobs, education or contacts in the private sphere. However, this tie can also be formed after start-up through a direct approach or through brokerage by other contacts. The next step in the model is a start-up identifying and connecting to prominent partners. Again the origins of these contact can be diverse. The last step concerns the actual decision of the financial resource provider to provide financial resources to the new venture. In this step the financial resource provider makes a decision to provide economic resources based on the information he has available. Part of this information is the status (strategic capital) of the new venture resulting from the connection/referral with the (prominent) partner, labeled as the indirect network effect. In this paper we focus in depth on type of an indirect network effect, namely a (prominent) partner acts as a referral source of the new venture.

By focusing on the start-up, financial resource provider and referral triangle we are able to get a better understanding of the direct and indirect role of networks in financing. The arrows between the actors represent the (potential) ties between the actors. By studying the network relations and positions within the triangle, we can identify interaction effects that determine the prominence of direct and indirect network effects in new venture financing.

## **PROPOSITIONS**

### **Burt or Coleman?**

In this section we concretize the model one step further by shaping propositions on the role of the network in the different sub processes as derived from our research model. Past research has provided mixed results on the effectiveness of strong vs. weak ties and dense vs. loosely coupled networks in (financial) resource acquisition. One of the central discussions on the effectiveness of networks is between Burt and Coleman, who both have different views on the mechanisms that foster an optimal network configuration.

On the one hand there is Burt (1982, 1992, 1997, 1999, 2000, 2005) who claims that optimal network value is created through structural holes. The structural holes argument claims that a certain actor can create value by brokering connections between segments that would be unconnected otherwise. Such a network provides unique information and control benefits to that actor. On the other hand, Coleman (1972, 1988, 1990) claims that network value is not created through structural holes but through dense networks and redundant ties. These network configurations improve the reliability of information because the same information can reach on actor from different sides, therefore creating value. Because dense and redundant networks increases trust and reliability of information within the network, actors in the network are more committed in doing a good job. For both Burt and Coleman the assumption is that the time and money of actors is limited. Therefore an actor has to make choices in configuring their network.

In the next section we shape propositions on the effectiveness of weak vs. strong ties and positional vs. cohesive network configurations. We shape propositions following the sub processes of our research model. In some sub processes the Burt and Coleman discussion is less relevant. In that case we turn to other research in order to be able to shape propositions.

## **Propositions**

The first step in our research model is a start-up getting connected to financial resource providers. Therefore our first propositions focus on this sub process. The connection between a new venture and a financial resource provider can have many origins. A company can be connected to a financial resource provider through previous jobs, education or private connections. However a start-up can also intentionally search for financial partners. In this case, two conditions have to be met. On the one hand, the start-up has to know what the financial options in the market are and second, the venture must be able to get in contact with the financial partners. For the first condition Burt would argue that start-ups having networks with many structural holes have access to more diverse information. Therefore these start-ups are better able to identify the potential financial partners and opportunities in their market. Coleman on the other hand stresses the value of trust and commitment in networks. Following his rationale one could reason that a start-up in dense networks will be informed more honest and accurate about the financial opportunities and resource providers. This will be the case because in dense networks the penalty for false and incomplete information will be higher. Since Burt and Coleman have different views on this process, the following contradicting propositions are shaped.

*Proposition 1a (Burt). Start-ups having networks rich in structural holes are better able to identify various financial options and financial resource providers.*

*Proposition 1b (Coleman). Start-ups in cohesive networks are better able to identify various financial options and financial resource providers.*

After having identified the financial options, a start-up has to connect to the financial partners. Following the pure logic of Burt, access to financial partners will be most effective through weak ties. Burt argues that under the assumption that time and resources are scarce, a network with weak ties that span structural holes will be most effective. For this step in our research model Coleman would disagree with Burt on the strength of tie argument. Since Coleman stresses the importance of trust and commitment, he will assume that strong ties are more helpful in accessing financial resource providers. Strong tie partners will be more committed and will better be willing to put ones name at stake for the start-up. Next to the commitment of strong ties, Brown & Reingen (1987) come up with another rationale why strong ties are favorable in getting access to people through referrals. They studied the referral behavior in a consumer setting and found that strong ties are more often used for referral behavior. It is striking that Burt (1998) in one of his studies argues that it is ineffective for low status/illegitimate actors to broker their own networks. For these actors it is more effective to “borrow” social capital of their network partners. In that case strong tie network partners are activated to help in getting access to unconnected resource providers. However for the purpose for our study, we would like to test the opposing views of Burt and Coleman. Therefore the following propositions are:

*Proposition 2a (Burt). Start-ups having networks with many weak ties are better able to access financial partners.*



*Proposition 2b (Coleman). Start-ups having networks with many strong ties are better able to access financial partners.*

In the next process of the research model the start-up identifies prominent partners. For the purpose of this paper we theorize on the situation of relating to unconnected prominent partners. The identification of prominent partners follows a similar logic as identifying potential financial partners. Again Burt will argue that start-ups having networks rich in structural holes are better able to identify the prominent partners. The many structural holes will function as a diverse pool for information on prominent partners. In Coleman's rationale trust and reliability play a more prominent role. Coleman would argue that the quality of information is higher in dense connected networks since the penalty for false and incomplete information is higher. Coleman would argue that start-ups in densely connected networks are therefore better able to identify prominent partners. Since Burt stresses the value of diversity of information and Coleman the importance on reliability the following contradicting propositions can be shaped.

*Proposition 3a (Burt). Start-ups having networks rich in structural holes are better able to identify prominent partners.*

*Proposition 3b (Coleman). Start-ups in cohesive networks are better able to identify prominent partners.*

After having identified prominent partners, a start-up has to get access to them. Burt would argue that weak ties will be more effective in doing so than strong ties. The underlying rationale is similar to getting access to financial partners. The claim of Burt is supported by a study of Lin (i.e. 1999). Lin theorizes on the effectiveness of weak ties by claiming that getting access to actors higher in a hierarchy is better realized through weak ties. Two actors having a strong tie are mostly considered to have a similar social status, so in order to connect to higher status actors weak ties are required. Coleman will stress the importance of strong ties in getting access to prominent partners because they will be more committed in helping the start-up. Several findings in related fields support the positive effect of strong ties in getting access to prominent partners. For example in a job market context Wegener (1991) found support that strong ties are favorable for low status actors in getting access to high status actors. Lin (1999) provided a review of studies on networks and social status and found mixed findings on tie strength and attained social status. Brown & Reingen (1987) studied the referral behavior in a consumer setting and found that strong ties are more often used for referral behavior. Since Burt and Coleman follow different rationales for getting access to prominent partners, the following propositions are shaped:

*Proposition 4a (Burt). Start-ups having networks with many weak ties are better able to access prominent partners.*

*Proposition 4b (Coleman). Start-ups having networks with many strong ties are better able to access prominent partners.*

We now are at the point that a new venture has a relation to potential financial resource providers and relations to a prominent partner. We now focus on the question

how and if the relations with the prominent partners are explicitly used to convince the financial resource provider. In this paper we are mainly interested in one role a (prominent) network partner can play in the financing process, namely acting as a referral source. For this question we follow a claim of Coleman. He claims that strong ties are more committed in helping the start-up through referrals. Added to this, Brown & Reingen (1987) found that strong ties are more often activated for referral behaviour than weak ties. It's interesting to note that this logic not only holds for referrals of prominent partners but as well for other referrals. Therefore proposition 5 can be stated as follows:

*Proposition 5a (Burt). Weak ties will be more often explicitly activated as a referral source than strong ties.*

*Proposition 5b (Coleman). Strong ties will be more often explicitly activated as a referral source than weak ties.*

We assume that the strength of the tie between start-up and financial resource provider has implications for the effectiveness of referrals. We don't have a specific assumption on the strength of tie between venture and resource provider, however the strength of tie has implications for the prominence of the referral network effect. When a new venture has a strong tie to the financial resource provider we argue that the referral effect of networks is lower. In that case the financial resource provider will have more direct information on the venture and will therefore rely less on other information sources like referrals.

*Proposition 6. A referral will have less impact when the tie between the financial resource provider and start-up is strong*

The strength of the ties between the new venture and referrers (not necessarily a prominent partner) has implications for its effect on a given investment decision. Past studies assume that the stronger the tie between venture and prominent partner or other referral source, the higher the referral network effect in financing decisions will be. A strong tie to a high status partner means that more status will "flow" to the new venture (Lai, Lin, & Leung, 1998; Lin, 1999; Benjamin & Podolny, 1999). The study of Batjargal (2005) also found support for the effectiveness of a strong tie between prominent partner/referrers and start-up for a referral. The logic so far supports the claim of Coleman on the effectiveness of cohesive and strong tie network configurations. However the logic of Burt could also provide some value here since strong ties face down sides as well. Burt would argue that prominent partners/referrers having a strong tie to a new venture will be biased towards a positive referral on the venture. There are situation in which a referral of a weak tie will be more influential than a referral of a strong tie. In showing this we will take the example of a father who tells at work that his son is a very talented soccer player. Since almost every father wants his son to be a talented soccer player most colleagues will doubt the actual talent of the son. However when the same man is not the father of the boy but an official scout of the soccer association telling about a boy he saw playing at a game last weekend his colleagues will not doubt the talent of the boy. Therefore proposition 7 a + b are as follows:

*Proposition 7a (Burt). A referral will have more impact when the tie between a start-up and the referral source is weak*

*Proposition 7b (Coleman). A referral will have more impact when the tie between a start-up and the referral source is strong*

## DATA

### Method

The application of network theory to the direct and (even more) the referral network effect in financing new ventures is in a start-up stage. Therefore sources to construct propositions on these two network effects in an entrepreneurial setting are scarce. Therefore the propositions in the previous section are constructed with help of general network theories or applications of the concept in other fields. In particular for propositions on the referral effect of networks, marketing and job search studies provided a valuable reference source. However there is still much uncertainty about the effectiveness of certain network relations and positions in getting financing. Therefore we see case study research as a valuable first step in exploring our propositions (Yin, 1994). The cases will provide more understanding of the mechanisms and rationales that play a role and which network characteristics are more effective in getting financing. On its turn the case studies can provide a base for a quantitative study.

There were several criteria in selecting our cases. In general, the start-ups we focus on can be labeled as front end technology-based firms (Groen, Jenniskens, & van der Sijde, 2005). These companies share some common characteristics like high technology uncertainty and have a huge need for financial capital. Subsequently we selected cases that are based in the Netherlands and have a special interest in the first 5 years of start-up. For this paper we studied a total of four cases.

Case A is a company founded in 1999 by two young entrepreneurs with a technology background and little business experience. In the early stage, the company was supported by the university's business development program. However, after a short while this help was not needed any more. The entrepreneurs quickly developed networking skills and won several prizes for innovation and new business. Currently the company has 25 employees.

Case B is a company founded in 2001 by an entrepreneur with over 20 years of technology and business experience. Before starting the entrepreneur had already a large network in the relevant market. His network and reputation had a large impact on the development of his company. Currently the company has about 20 employees.

In 2004 Case C was founded as a spin-off of three companies. The owner had little business experiences and a moderate technology background. For its development, the company heavily relied and still relies on the parent companies. Currently the company has three employees.

Case D is founded in 2004 by an entrepreneur with moderate business and extensive technology experience. The entrepreneur had a large network at start and had much experience in applying for government grants. Therefore the entrepreneur was able to

finance his company solely on private investments and government grants. Currently the company has 2 employees.

### **Data sources**

Table 1 provides an overview of the different data sources we used in collecting our data. A first step in constructing the case studies was an exploration of the companies' websites and other online sources. Additionally, we had TOP files<sup>i</sup> available for two companies. These files were an additional source in order to construct a first picture of the start-ups. Subsequently we asked the companies to fill in the Monitor Technostarter, which is constructed based on the 4S model. Using this monitor helped us to get much data and a complete overview on the central elements that play a role in starting a business as derived from our fundamental theoretical model. Finally we interviewed the entrepreneurs in order to be able to ask specific questions on the role that networks play in financing their business. After the interview, the entrepreneurs were asked to fill in a short questionnaire to score the strength of relations they had to people they mentioned during the interview.

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Insert Table 1 about here  
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### **Using measures during the interview**

The focus of this paper is on the effectiveness of structural holes vs. closure and weak vs. strong ties in financing high technology start-ups. However since we intend to extend the findings of this case study paper to a larger data set, we choose to use existing measures that are used to measure these network characteristics. First, it will give us some guidance to score multiple network characteristics, and second it will help us to reflect on these network measures. For the positional part of the network we chose to use the network tool of McEvily and Zaheer (1999; Scholten, 2006). This tool asks entrepreneurs to mention five or less people they turn to for advice on business issues and if these people are related. We extended this tool by asking the entrepreneurs to score how well these people know each other on a five point scale. We recognize that asking the entrepreneurs to score the strength of relations between their information sources on a five point scale can be arbitrary, however in a case study setting we assume that it can provide interesting insights.

For the relational discussion we decided to use the many used assessment of tie strength by Granovetter (1973; Scholten, 2006). This measure gives an indication of tie strength by asking questions on intimacy, frequency and length of contact. In this case study we will as well try to test the value of these three different variables on the acquisition of financial capital. For example it could be that for example intimacy is much more effective than for example length of relation. The assessment of the relevance of the different variables will enable us to select the most relevant variables for our quantitative study later on.

## **RESULTS**

In this section we will discuss the findings resulting from the case studies. The findings in the case studies are summarized in table 2-13. These tables can be found at

the end of this paper. Based on these results we will discuss the findings per proposition as constructed in a previous section of this paper.

*Proposition 1a (Burt). Start-ups having networks rich in structural holes are better able to identify various financial options and financial resource providers.*

*Proposition 1b (Coleman). Start-ups in cohesive networks are better able to identify various financial options and financial resource providers.*

The first set of propositions deals with the effectiveness of structural holes vs. closure in discovering financial opportunities. First of all our results show that the positional network configuration of a start-up company is heavily dependent on the entrepreneurs personal network before starting and the development stage of the company. The entrepreneurs of case B and D both had substantial working experience in the market where they started their company. Therefore their networks when starting their business could be described as big and diverse. They both had extensive contacts in business & technology. In theoretical sense we would label their networks as structural hole networks from start. However when looking at financing their business both entrepreneurs indicate that they don't consult external sources on financing issues. When looking at the finance structure of case B we see five different types of funding, being quite diverse. Case D however has only one source of external financing, however this is not because they were not able to identify other finance opportunities but because the entrepreneur didn't want others to finance. The entrepreneur in case D is experienced in getting government grants and was and is able to finance his company with grants 100%, although other parties wanted to invest.

The network of case A could be labeled as a small closure network when starting. The entrepreneurs started from a PhD position and had little industry experience. However, they were very focused on expanding their network from start in diverse directions and were successful in doing so. The older the company got, the more the company can be labeled as having a structural hole network configuration. When looking at its finance structure one will see that they use 6 different sources of financing, being a diverse set of financial sources. For the identification of financial opportunities the entrepreneurs turn to the participation company, the bank and an informal investor. The network of case C can be labeled as small, homogeneous and interconnected. In theoretical terms it could be labeled as a closure network. From start it heavily depended on its three shareholders and is still doing so for access to finance. When analyzing the finance structure of case C you see that its financing is quite homogeneous. The entrepreneur indicated that he wants to grow fast, however beside of a bank loan and government grants he was not able to identify or access other finance sources.

In conclusion we argue that for the identification of financial opportunities, spanning structural holes are more effective. In concluding this we take the number of different finance sources as an indicator for the ability to identify financial opportunities. Those cases spanning structural holes have more diverse financing (except case D, but this had an other reason) than case C, which could be labeled as having a clique network. *Therefore we conclude that for this process proposition 1a has more explanatory value than proposition 1b.*

*Proposition 2a (Burt). Start-ups having networks with many weak ties are better able to access financial partners.*

*Proposition 2b (Coleman). Start-ups having networks with many strong ties are better able to access financial partners.*

For the purpose of this set of propositions I distinguish between two types of financial resource providers. First I will focus on the resource providers accessed with help of a referral and second I focus on financial resource providers accessed without help. For this set of propositions the situation when a start-up was connected to a financial resource provider before starting the business is less relevant. The two companies started by “inexperienced” entrepreneurs more heavily depend on referrals in accessing financial resource providers. The lack of experience, a network and legitimacy/status in the market didn’t allow them to access financial resource providers as easy as their “experienced” counterparts. In Case A and C (the inexperienced entrepreneurs) we identified 6 financial decisions in which a referral played a role. The contacts with these referrals were scored as somehow/very intimate and were quite frequent (1/week or 1/month). So for start-ups having little experience and legitimacy/status in the market strong ties seem to be more favorable in accessing financial resource providers, *hereby providing support for proposition 2b.*

For the two companies that are started by “experienced” entrepreneurs, a different logic seems to be effective. Both case B and D had a large and diverse network from start and had legitimacy/status in their market. Therefore they weren’t dependent on referrals in getting access to financial resource providers. The logic in accessing financial resource providers is mostly that the tie starts with a weak tie through an encounter at for example a conference or on initiative of the financial resource provider and develops gradually to a strong tie. A similar logic can be found at case A now, because at the moment they have built a substantial track record to be able to access financial resource providers themselves. Therefore our findings show that for “experienced” entrepreneurs and start-ups in later stages of their development, weak ties are more effective in accessing financial resource providers than strong ties. *Hereby providing support for proposition 2a.*

*Proposition 3a (Burt). Start-ups having networks rich in structural holes are better able to identify prominent partners.*

*Proposition 3b (Coleman). Start-ups in cohesive networks are better able to identify prominent partners.*

In discussing proposition 1a and 1b we already gave a typology of the positional network characteristics of our four cases. We identified case B and D as having a network rich in structural holes from start. Case A is a start-up that started from a closure situation but was very rapidly able to change their network into a situation which can be considered as a network spanning structural holes. Case C started and still is in a closure situation. When the entrepreneurs were asked to explain how they met prominent partners one could see differences between the answer between the structural holes type of network and the closure network. Although the entrepreneurs (In particular in case B and D) stressed the importance of coincidence of getting connected to prominent partners, they are really actively going out to conferences and trade shows. So one could not push the process of getting aware and in contact to

prominent partners, however you can intentionally put yourself in the situation were “coincidence” is more likely. On the other hand, the entrepreneurs with a more closure type of network (A in the beginning and C) are less active in going to conferences and trade shows but rely on general source like the internet in identifying prominent players in their market.

So there is a difference in identifying prominent players between a structural hole and closure type of network. When analyzing the number of prominent partners a start-up actually has differences can be identified. Both case B and D were able to mentioned a large number of prominent partners in a diversity of areas (business, universities etc.) they were connected to. When looking to the diversity of prominent partners, one could not see large differences. However a structural hole network type seems to be favorable to identify a larger number of prominent partners. *Therefore we argue that proposition 3a has more explanatory value than proposition 3b in this process.*

In our case studies we were not able to compare how prominent partners were. For example it could be the case that the one case has more prominent partners than the other. Getting an objective measure for how prominent a player is, is difficult, in particular when wanting to compare prominent partners in different markets and technologies.

*Proposition 4a (Burt). Start-ups having networks with many weak ties are better able to access prominent partners.*

*Proposition 4b (Coleman). Start-ups having networks with many strong ties are better able to access prominent partners.*

Getting access to prominent partners follows a similar logic to getting access to financial resource providers. The effectiveness of network configurations is again heavily dependent on the experience of the entrepreneur when starting and the start-ups development stage. Again you see that the two companies started by inexperienced entrepreneurs (A + C) were dependent on referrals when accessing prominent partners in nine cases. The relations to the people that acted as a referral are labeled as somehow/intimate and the frequency of contact was between 1/week and 1/2 months. Therefore we argue that for start-ups having little business experience strong ties to referral sources are more effective than weak ties in getting access to financial resource providers. *So for this group of start-ups proposition 4b seems to be most effective.*

For the start-ups that were founded by experienced entrepreneurs weak ties seem to be effective. Because these start-ups have a larger network and legitimacy/status in the market they are better able to access prominent partners directly. *Therefore proposition 4a seems to have more relevance for this group of start-ups.* Next to experience when starting, stage of development is as well a factor in accessing prominent partners directly. Start-ups like case A have builded a track record and therefore you see that as the legitimacy, status and network grows, directly accessing prominent partners becomes more efficient.

In the following propositions the attention is focused on the role of referrals in financing. Our findings show that referrals are mostly used at start-ups founded by entrepreneurs who have little experience. Because these start-ups (Case A+B) initially

have small networks and lack legitimacy/status in the market they largely depend on their strong ties to provide them access to other actors as explained in the previous propositions. These start-ups see much value in using their partners as an explicit referral source. However, companies founded by more “experienced” people (Case C+D) don’t use their partners as a referral source. However they see much value in using their partners as a more implicit information signal, in particular when it concerns applying for government grants.

In our research model we assumed that referrals of partners are favorable in acquiring financial resources when these partners are prominent. However our findings show that referrals of less prominent partners can be just as effective. Our findings indicate that in case of a stronger tie between referral source and financial resources provider the requirement of a partner being prominent decreases. Therefore we will continue to study the role of referrals in the next propositions not only for prominent partner but as well for referrals of less prominent partners.

*Proposition 5a (Burt). Weak ties will be more often explicitly activated as a referral source than strong ties.*

*Proposition 5b (Coleman). Strong ties will be more often explicitly activated as a referral source than weak ties.*

In our cases we identified seven financial decisions in which a referral played a role. When analyzing the referrals sources that helped in getting access to the financial resource providers, we find that in none of the case the intimacy of the contact was scored as “little”. Additionally, the frequency of contact with the referral source was quite frequent with a 1/week or 1/month contact frequency. The length of a relation to a referral source seems to play a minor role. Applying a similar analysis to referrals that played a role in getting access to prominent partners, we find a somewhat similar pattern. In the nine cases in which referrals helped in getting access to prominent partners, in all cases the intimacy of the contact was scored as somehow. Additionally the frequency of contact to these referral sources varied between 1/week and 6/year. Important to note is that in four of these cases the university spin-off centre was involved. It seems to be that at this centre a weaker tie is sufficient in acting as a referral source because this centre is aimed at helping start-ups (frequency of 6/year). Again the length of contact seems to play a minor role. In conclusion it seems to be that referrals are mostly activated when the intimacy of the contact is scored as somehow/very and the frequency of contact is around 1/week or 1/month. Length of relation seems to play a minor role in acting as a referral source. *All together we conclude that strong ties are more often explicitly activated as a referral source than weak ties.* We continue by discussing the tie strengths that are most effective in a referral.

*Proposition 6. A referral will have less impact when the tie between the financial resource provider and start-up is strong*

In studying our cases we found seven financial decisions in which a referral played a role. However for the purpose of this proposition I would like to distinguish between two different effects of a referral. The first effect is the connecting function of a referral; the second effect is the influence of a referral on the actual finance decision. These two effects of referrals seem to vary between the different financial resources



providers. The different financial resource providers require different tie strengths before they invest. On the one hand our results show that informal investors and the university only participate when they are relatively strongly connected to a start-up. In the cases where an informal investor or university invested in the company the intimacy of the contact was scored very intimate and the contact frequency was between 1/week or 1/month. On the other hand for a bank or government grant, relatively weaker ties are sufficient. Participation companies and private companies seem to be somewhere in the middle of these two extremes. For the financial resource providers that need a strong tie to the start-up before financing, the connecting function of a referral is most important. However when a weak tie is sufficient for financing, in our cases the decision of a bank to invest in case C and to a minor extend the participation company investing in case B, the effect on the actual decision to invest was bigger. Therefore it seems to be that *our cases support proposition 6*.

*Proposition 7a (Burt). A referral will have more impact when the tie between a start-up and the referral source is weak*

*Proposition 7b (Coleman). A referral will have more impact when the tie between a start-up and the referral source is strong*

In our case studies we identified seven financial events in which a referral played a role. In these events we cannot find a pattern which allows us to conclude that a stronger tie is better than a weak tie to a referral source. Since we found no event in which a weak tie acted as a referral we are not really able to compare these to extremes. However, we had some differences between “strong” and “stronger” ties, however when analyzing this differences we didn’t find differences in effectiveness of referral. Extending the analysis to the referrals that helped in getting connected to prominent partners, we found some support that referrals of contacts that are more frequent are more effective in getting connected to prominent partners. *However, we are not able to prefer proposition 7a over 7b or the other way around*. Studying more cases or conducting a quantitative study could provide more insight. Table 14 provides an overview of our findings.

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Insert Table 14 about here  
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## CONCLUSIONS/DISCUSSION

Our results show some interesting insights in the optimal positional and relational network configurations for acquiring financial resources. First of all it seems that a network rich in structural holes is favorable for start-up entrepreneurs having various experience levels, knowledge and in different stages of development. Start-ups having networks rich in structural holes tend to have a more diverse finance structure and more prominent partners. We claim that a network rich in structural holes helps a start-up better in identifying the various prominent partners and financial opportunities than a closure network structure.

The optimal relational network characteristics for getting financing are dependent on the experience, knowledge and stage of development of the entrepreneur/start-up. Our results indicate that more experience, more knowledge and a latter stage of

development increase the value of having weak ties. Because these characteristics give the entrepreneur/start-up more status/legitimacy in the market, they can directly access financial resource providers and prominent partners by ties that are initially weak. So for this type of start-up direct network effects seem to play a larger role in getting financed. This does however not imply that they do not profit from having prominent partners in getting financing. Although these entrepreneurs/start-ups don't use explicit referrals in accessing financing, they acknowledge the value of mentioning a prominent partners in applying for a government grant. However, for start-ups in earlier stages of development having less experience and knowledge strong ties seem to have more value. Because these start-ups lack legitimacy/status in the market, they are more dependent on their strong ties that act as a referral in accessing financial resource providers and prominent partners. In general we found that strong ties are more often activated as a referral source than weak ties. This mechanism seems to be active in particular in accessing financial resource providers that invest under larger uncertainty. So more inexperienced entrepreneurs and new ventures in early stages of their life cycle are more heavily rely on indirect network effects in getting financed.

The conclusions above have large implications for theory. Whereas in literature a structural hole network is often coupled to the effectiveness of weak ties and a closure network coupled to the effectiveness of strong ties, our findings show that positional and relational network characteristics cannot be coupled this simple. Start-ups having little experience and in early stages of development seem to profit from a network rich in structural holes combined with having strong ties, hereby proving the effectiveness of structural holes combined with having strong ties. Next to the implications for general network theory our findings show the value of the 4S model. Some studies study the effect of networks on the acquisition of financial resource without controlling for important variables. Our findings show that next to the social network an economic dimension, we should as well include strategic (legitimacy/status) and cultural (knowledge/experience) factors in order to fully understand the role of network in financing high tech start-ups.

On a more operational level, we tested the value of two theoretical measurement tools for networks. For the positional network identification we included the McEvily and Zaheer (1999) question in our interview. Their tool was very helpful in getting a feel of a start-ups positional network structure. For tie strength we used the three questions of Granovetter (1973) on intimacy, frequency and length of contact. Our case studies however showed that intimacy and frequency had more value in indicating strength of tie and willingness to act as a referral source than length of contact.

An additional interesting finding concerns the effectiveness of referrals and the prominence of the referral source. In shaping our propositions we assumed that a referral of a partner is more effective when this partner is prominent. However our findings show that this is not always the case. Our findings show that the stronger the tie between referral source and financial resource provider, the less important the prominence of the referral is. It seems that when these two actors are strongly tied, the personal trust and commitment between these actors is more important than the prominence of the partner.

Our findings showed that several characteristics of the start-up have a large impact on the effectiveness of certain network configurations. However our findings show that also the characteristics of the financial resource provider and the prominent partners involved play a role. For example different financial resource providers require different tie strength for financing. For example for a bank a weak tie is sufficient in order to get financing, whereas for an informal investor a strong tie connection is required before he will provide financial resource to the firm. This has implications for the role that referrals play at different financial resource providers. For financial resource providers where a weak tie is sufficient for financing, the actual impact on the decision is bigger, whereas for financial resource providers that require a strong tie before they finance the connection function of a referral is more important.

Added to this the type of prominent partner that acts as a (explicit/implicit) referral is as well important in the financing process. Our results show that referrals of business partners are valued over referrals of university partners. The finding that different types of financial resource providers and prominent partners have an effect on optimal network configurations has implication for future research as explained in the next section

### **SHORTCOMINGS/DIRECTIONS FOR FUTURE RESEARCH**

Our case studies provide some interesting insights. However, this paper provides many interesting directions for future research. First a quantitative study on our research subject could be a good thing in order to statistically back up our findings. In addition, our case studies showed that the effectiveness of certain network configurations is heavily dependent on several key variables. For example the experience and network an entrepreneur has before starting up his business, the life stage of a company and the different types of financial resource providers and prominent partners all have implications for the effectiveness of certain network configurations. So by including these factors in a quantitative study could enable us to be very specific on the exact role these factors play in networking for financing.

An other interesting direction for future research is extending the role of networks with simply being connected to a prominent partner without using it as a referral. This case study paper mainly focused on the role of referrals in financing. However, our findings indicate that simply being connected to prominent partners can as well have a strong information effect to financial resource providers. Therefore future studies should as well focus more on this network mechanism.

Focusing on other resources as well could be an additional direction for future research. Since we focused on the acquisition of financial resources, future research should as well focus on the different network effects as identified in this paper in acquiring for example strategic capital or human capital.

Finally, in this paper we took the perspective of the start-up company. A nice addition would be studying the perspective of the investor as well. Studying this perspective as well would provide more insight in the most effective network configurations from their perspective. For example it would be possible to study the strength of tie between referral and financial resource provider and its effect on the financing decision. Additionally when combining this with the result of the study from a start-up

perspective, it would be possible to study all kinds of interaction effects. For example we could study interactions between strengths of ties between start-up and financial resource provider, start-up and referral and financial resource provider and referral source!

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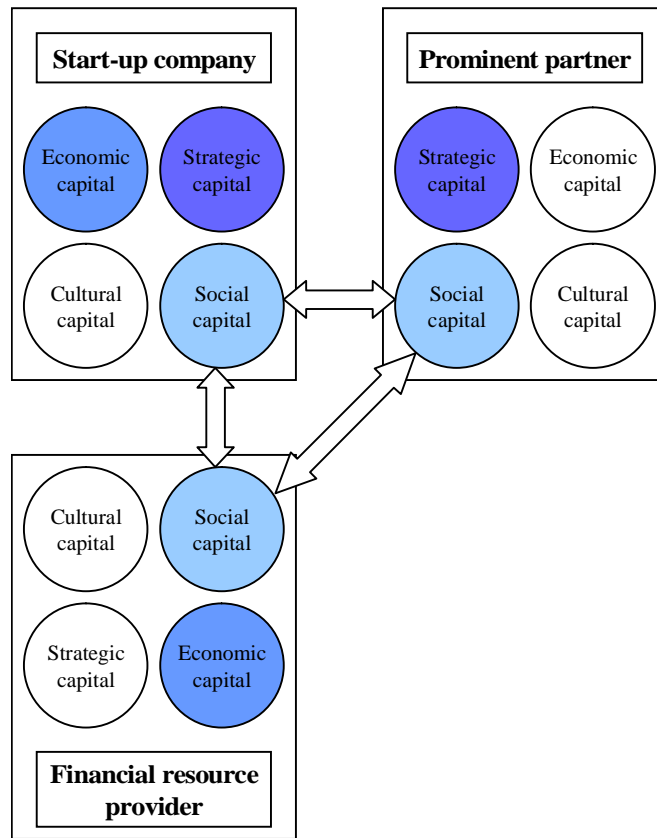


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**FIGURE 1**

**The research model**



**TABLE 1**

**Data sources**

	<b>Case A</b>	<b>Case B</b>	<b>Case C</b>	<b>Case D</b>
Monitor technostarter	x	x	x	x
Interview	x	x	x	x
Short questionnaire	x	x	x	x
TOP file	x	-	x	-
Company website	x	x	x	x
Other online sources	x	x	x	x

x = Data source available  
- = Data source not available

**TABLE 2****Main information sources case A**

<b>Information source</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation (2006)</b>
Other Entrepreneur	Very	1/week	6 year
Informal investor	Very	1/week	5 year
BD University research institute	Very	1/month	5 year
Participation company	Somehow	1/month	> 7 year
Bank	Little	3/year	7 year

**TABLE 3****Interconnectiveness information sources case A**

<b>Information source</b>	Other entrepreneur	Informal investor	BD University research institute	Participation company	Bank
Other Entrepreneur	xxxx	-	-	3	-
Informal investor	xxxx	xxxx	2	5	1
BD University research institute	xxxx	xxxx	xxxx	5	-
Participation company	xxxx	xxxx	xxxx	xxxx	3
Bank	xxxx	xxxx	xxxx	xxxx	xxxx

XXXX = Not applicable

- = No relation

1-5 = Assessment of the strength of tie by the entrepreneur

**TABLE 4**

**Main information sources case B**

<b>Information source</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation (2006)</b>
MT	Very	1/week	5-10 year
Board	Very	1/month	5-20 year
Shareholders	Somehow	1/month	4-20 year

**TABLE 5**

**Interconnectiveness information sources case B**

<b>Information source</b>	MT	Board	Shareholder
MT	xxxx	3	3
Board	xxxx	xxxx	3
Shareholders	xxxx	xxxx	xxxx

XXXX = Not applicable

- = No relation

1-5 = Assessment of the strength of tie by the entrepreneur

**TABLE 6****Main information sources case C**

<b>Information source</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation (2006)</b>
Wife	Very	1/week	15 year
Other Entrepreneur	Very	1/week	2 year
Other entrepreneur	Somehow	1/week	2 year

**TABLE 7****Interconnectiveness information sources case C**

<b>Information source</b>	Wife	Other entrepreneur	Other entrepreneur
Wife	xxxx	-	-
Other entrepreneur	xxxx	xxxx	5
Other Entrepreneur	xxxx	xxxx	xxxx

XXXX = Not applicable

- = No relation

1-5 = Assessment of the strength of tie by the entrepreneur

**TABLE 8****Main information sources case D**

<b>Information source</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation (2006)</b>
Employee	Very	1/week	4 year
University researcher	Very	2/month	10 year
Manager at other company	Very	1/month	12 year
Manager at other company	Somehow	1/month	4 year
Manager at other company	Somehow	1/month	3 year

**TABLE 9****Interconnectiveness information sources case D**

<b>Information source</b>	Employee	University researcher	Manager at other company	Manager at other company	Manager at other company
Employee	xxxx	-	5	-	1
University researcher	xxxx	xxxx	1	5	-
Manager at other company	xxxx	xxxx	xxxx	1	-
Manager at other company	xxxx	xxxx	xxxx	xxxx	-
Manager at other company	xxxx	xxxx	xxxx	xxxx	xxxx

XXXX = Not applicable

- = No relation

1-5 = Assessment of the strength of tie by the entrepreneur

**TABLE 10****Ties to financial resource providers**

<b>Company</b>	<b>Finance source</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation (2006)*</b>
<i>Company A</i>	Informal investor	Very	1/week	5 year
	University	Very	1/month	5 year
	Participation company	Somehow	1/month	> 7 year
	Personal loan	Somehow	3/year	7 year
	Bank	Little	3/year	7 year
	GG	Little	1/year	n.a.
<i>Company B</i>	Informal investors	Very	1/month	4/5 year
	University	Very	1/week	>10 year
	Other company	Somehow	1/year	10 year
	Participation company	Somehow	3/year	5 year
	GG	Little	3/year	n.a.
<i>Company C</i>	Other company	Very	1/week	2 year
	Other company	Somehow	1/week	2 year
	Other company	Somehow	1/month	9 year
	GG	Somehow	1/year	n.a.
	Bank	Little	1/month	1 year
<i>Company D</i>	GG	Somehow	3/year	n.a.



**TABLE 11**

**Referrals and getting access to financial resource providers**

<b>Company</b>	<b>Finance source</b>	<b>Referral as the source of contact</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation 2006</b>	<b>Importance of referral</b>
<i>Company A</i>	Informal investor	Participation company	Somehow	1/month	>7 year	+
	University	BD officers university	Somehow	6/year	7 year	+
	Participation company	No	****	****	****	****
	Bank	No	****	****	****	****
	GG	No	****	****	****	****
	Personal loan	No	****	****	****	****
<i>Company B</i>	Participation company	BD officer research institute	Very	1/week	>10 year	+
	Other company	No	****	****	****	****
	University	No	****	****	****	****
	Informal investors	No	****	****	****	****
	GG	No	****	****	****	****
<i>Company C</i>	Other company	Business partner	Very	1/week	2 year	++
	Bank	Business partner	Very	1/week	2 year	++
	Other company	Business partner	Somehow	1/week	2 year	++
	Other company	Business partner	Somehow	1/month	9 year	++
	GG	No	****	****	****	****
<i>Company D</i>	GG	No	****	****	****	****

**TABLE 12**

**Ties to prominent partners**

<b>Company</b>	<b>Prominent partners</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation 2006</b>	<b>Indirect importance of prominent partner(s) in financing</b>
<i>Company A</i>	Informal investor	Very	1/week	5 year	0
	University research institute	Very	1/month	5 year	+/-
	University professor	Very	3/year	6 year	+/-
	Business coach	Somehow	1/year	6 year	0
	Business coach	Little	1/year	6 year	0
<i>Company B</i>	University research institute	Very	1/week	>5 year	+/-
	Large customer (s) *	Somehow	1/month	1-5 year	0
	Alliances **	Somehow	1/month	1-5 year	+
<i>Company C</i>	Other Entrepreneur	Very	1/week	2 year	0
	Big company	Somehow	1/month	2 year	0
	Big company	Somehow	1/month	2 year	0
	Big company	Somehow	1/month	2 year	+
	University research institute	Somehow	2/month	12 year	+/-
	University professor	Somehow	6/year	2 year	+/-
<i>Company D</i>	University research institute	Very	1/week	>5 year	++
	Big company	Very	1/week	< 2 year	++
	Big company	Somehow	1/month	4 year	++
	Big company	Somehow	1/month	3 year	++
	Scientific institute	Somehow	1/month	< 2 year	++
	Big companies***	Somehow	1/month	1-5 year	++

\* This is a group of different customers sharing the same network characteristics with respect to the company studied

\*\* This is a group of different alliance partners sharing the same network characteristics with respect to the company studied

**TABLE 13**

**Referrals and getting access to prominent partners**

<b>Company</b>	<b>Prominent partners</b>	<b>Referral as the source of contact</b>	<b>Intimacy of contact</b>	<b>Frequency</b>	<b>Length of relation 2006</b>	<b>Importance of referral in getting connected</b>
<i>Company A</i>	Informal investor	Participation company	Somehow	1/month	>7 year	+
	Business coach	BD officers university	Somehow	6/year	7 year	+
	Business coach	BD officers university	Somehow	6/year	7 year	+
	University professor	BD officers university	Somehow	6/year	7 year	+
	University research institute	BD officers university	Somehow	6/year	7 year	+
<i>Company B</i>	Large customer (s) *	No	****	****	****	****
	Alliances **	No	****	****	****	****
	University research institute	No	****	****	****	****
<i>Company C</i>	Big company	Company that invested in C	Somehow	1/week	2 year	++
	Big company	Company that invested in C	Somehow	1/week	2 year	++
	Big company	Company that invested in C	Somehow	1/week	2 year	++
	Other Entrepreneur	Company that invested in C	Somehow	1/week	2 year	++
	University research institute	No	****	****	****	****
	University professor	No	****	****	****	****
<i>Company D</i>	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	University research institute	No	****	****	****	****
	Scientific institute	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****
	Big company	No	****	****	****	****

**TABLE 14**

**Propositions/Results**

Proposition 1a (Burt). Start-ups having networks rich in structural holes are better able to identify various financial options and financial resource providers	+
Proposition 1b (Coleman). Start-ups in cohesive networks are better able to identify various financial options and financial resource providers	-
Proposition 2a (Burt). Start-ups having networks with many weak ties are better able to access financial partners.	+*
Proposition 2b (Coleman). Start-ups having networks with many strong ties are better able to access financial partners	+**
Proposition 3a (Burt). Start-ups having networks rich in structural holes are better able to identify prominent partners	+
Proposition 3b (Coleman). Start-ups in cohesive networks are better able to identify prominent partners	-
Proposition 4a (Burt). Start-ups having networks with many weak ties are better able to access prominent partners	+*
Proposition 4b (Coleman). Start-ups having networks with many strong ties are better able to access prominent partners	+**
Proposition 5a (Burt). Weak ties will be more often explicitly activated as a referral source than strong ties	-
Proposition 5b (Coleman). Strong ties will be more often explicitly activated as a referral source than weak ties.	+
Proposition 6. A referral will have less impact when the tie between the financial resource provider and start-up is strong	+
Proposition 7a (Burt). A referral will have more impact when the tie between a start-up and the referral source is weak	?
Proposition 7b (Coleman). A referral will have more impact when the tie between a start-up and the referral source is strong	?

\* Proposition true for entrepreneurs with extensive experience in the market/technology

\*\* Proposition true for entrepreneurs lacking extensive experience in the market/technology

## APPENDIX

### Case description case A

Case A is a company founded in 1999 by two young entrepreneurs with a technology background and little business experience. In the early stage, the company was supported by the university's business development program. However, after a short while this help was not needed any more. The entrepreneurs quickly developed networking skills and won several prizes for innovation and new business. Currently the company has 25 employees.

The positional network could be described as a clique network at start. The network of the company was mainly focused on technology and less on market. However the entrepreneurs were very eager to develop their network. Hereby they were helped by the University's business development department. After a short while this help wasn't needed anymore and the entrepreneurs were able to expand their network in multiple directions on their own. Next to their developed network skills, the winning of several prizes helped them in getting a status in the market. Therefore accessing new partners themselves became more effective. In the current situation the network could be labeled as a network rich in structural holes.

For financing the company uses a variety of sources. One source (the participation company) had already a weak connection to the company before starting. The bank, Government Grants and a personal loan were accessed by the entrepreneurs themselves. The university and the informal investor were connected through mediate/strong tie referrals. In the current situation the company goes for financing information to the informal investor, the participation company and the bank. When asking the company about its most prominent partners a variety of partners came up. The prominent partners explicitly mentioned were all accessed through mediate/strong tie referrals.

### **Case description case B**

Case B is a company founded in 2001 by an entrepreneur with over 20 years of technology and business experience. Before starting the entrepreneur had already a large network in the relevant market. His network and reputation had a large impact on the development of his company. Currently the company has about 20 employees.

In theoretical terms the positional network of case B can be described as a structural hole network from start. Because of his experience and reputation the entrepreneur is able to directly connect to new partners without help from referral sources. The entrepreneur was and is very active in visiting conferences and trade shows. The entrepreneur sees this as an intentional strategy to enhance the chance of getting new contacts. Meeting a new partner is often described as coincidence; however the entrepreneur claims that you can manipulate the factors that enhance “coincidence”.

For accessing financial resources the company was not dependent on referrals. The company has five types of different financial sources. The other company that invested in B and the University were already connected to the entrepreneur before starting. The government grants and informal investor were accessed by the entrepreneur himself without help from a referral. Only in accessing the participation company, the company had some help a (strongly tied) research institute business developer. The entrepreneur doesn't consult external information sources for financing because he claims that all financial expertise is present in the company. The company has a wide variety of prominent partners, all accessed without help of explicit referrals.

### **Case description case C**

In 2004 Case C was founded as a spin-off of three companies. The owner had little business experiences and a moderate technology background. For its development, the company heavily relied and still relies on the parent companies. Currently the company has three employees.

The network of can be described as a closure network when starting. The company is a spin-off of three companies and is still heavily dependent on these companies in developing its networks. In contrast to case B, the entrepreneur of company C states that he doesn't visit many conferences and trade shows since it takes a lot of time. Although the size of the network has grown over time, the network of C can still be labeled as a closure network, since the network is still very redundant.

In accessing financial resource providers, the network is/was very dependent on referrals. Only for Government Grants, referrals didn't play a role. However for the three other companies and the bank, referrals of mediate/strong ties played a very important role. In getting connected to prominent partners, a similar pattern can be identified. In particular for prominent market partners, strong ties were an important referral source.

## Case description case D

Case D is founded in 2004 by an entrepreneur with moderate business and extensive technology experience. The entrepreneur had a large network at start and had much experience in applying for government grants. Therefore the entrepreneur was able to finance his company solely on private investments and government grants. Currently the company has 2 employees.

Similar to case B, the network of D can be described as rich in structural holes from start. The entrepreneur has extensive experience in working for a university. In working for the university he was responsible for writing and executing many project proposals. In doing this work he gathered extensive contacts within universities and business, because getting funding is often dependent on having a variety of partners cooperating in the project. When starting the business the entrepreneur uses the network he developed when working for the university. Added to this the name and status he gained in doing this work helps him in getting direct access to new partners.

The financing of company D is quite a rare case. Because the entrepreneur had much experience in applying for Government Grants, he is able to fully finance his company by Government Grants (next to a personal investment). The entrepreneur doesn't consult external information sources for financing, because the company has the knowledge of applying for Government Grants within the company and has no additional need for money. The prominent partners of the company as mentioned in the interview, were all accessed directly without using a referral.

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<sup>i</sup> At the University of Twente there is a support program for entrepreneurial start-ups. When supporting the start-ups a file is kept on the development of the company containing several versions of business plans and notes of meetings with the support coaches. More information on the TOP program can be found at [www.utwente.nl/top](http://www.utwente.nl/top)