CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This dissertation consists of five empirical studies that examine how social networks influence the performance and innovativeness of new technology ventures in an emerging industry. The goal of this introductory chapter is to demonstrate how these studies, both individually and collectively, make a contribution to the network and entrepreneurship literatures. To achieve this objective, I first discuss the theoretical and practical significance of research on entrepreneurship and social networks. I specifically review past scholarly work within this research domain and distill several contemporary theoretical debates that deserve further research attention. In the second part of this chapter, I discuss the precise research questions and contributions of the present dissertation. This section introduces a research framework that covers three emerging research themes in the literature on social networks and entrepreneurship. I discuss how the empirical studies address each of these themes and how they are interrelated. The chapter concludes with a description of the research design and an overview of the empirical chapters in this dissertation.

1.2 STRATEGIC ENTREPRENEURSHIP AND ENTREPRENEURIAL NETWORKS

As contemporary society is undergoing a fundamental shift away from a managed economy towards a knowledge-based economy, there has been a revived interest in the concept of entrepreneurship among scholars, managers, and policy makers (Audretsch & Thurik, 2001). Especially the increasingly important role of new start-up firms for economic growth, innovation, and job creation has stimulated social scientists to incorporate entrepreneurship into their theoretical models (Swedberg, 2000). Yet different views on what entrepreneurship precisely entails prevail in the literature (see Bull & Willard, 1993; Hébert & Link, 1989; Lumpkin & Dess, 1996 for reviews). Historical perspectives have conceptualized entrepreneurship as the generation of profits from undertaking uncertain investments (Cantillon, 1755; Knight, 1921), the act of innovation and creative destruction (Schumpeter, 1934), alertness towards profit opportunities (Kirzner, 1997), the coordination of scarce resources (Casson, 1982), and the creation of new organizations (Gartner, 1988). More recent work has synthesized these different views by highlighting that entrepreneurship revolves around the pursuit of opportunities (Hitt et al., 2001; McGrath & MacMillan, 2000;
Stevenson & Jarillo, 1990). Accordingly, entrepreneurship as defined in this dissertation involves the discovery, evaluation, and exploitation of opportunities to create future goods and services (cf. Shane & Venkataraman, 2000).

New technology ventures, defined as firms less than eight years old that commercialize technological opportunities (Zahra, 1996), are considered a key area of research within the field of entrepreneurship (Song et al., 2008). These firms may contribute to economic growth and innovation by commercializing disruptive technologies that rejuvenate established markets or even create entirely new industries (Tushman & Anderson, 1986). Yet while new technology ventures are generally considered the bedrock of entrepreneurial wealth-creation, recent empirical evidence has shown that most new firms exhibit low survival rates, grow little, and are not very innovative (Aldrich, 1999; Shane, 2008). Data from various large-scale studies demonstrate that about half of all new firms dissolve within five years (e.g., Evans & Leighton, 1989; Boden & Nucci, 2000). Failure rates of ventures that commercialize new technologies may even be higher. For instance, a study of 11,259 technology-based ventures in the U.S. found a survival rate of only 21.9 percent after five years (Song et al., 2008). As for growth, empirical evidence shows a similar pattern. Based on a review of several representative datasets, Shane (2008) estimates that less than 10 percent of all new ventures ever grow. With regard to innovation, scholars have discovered that most new firms tend to imitate the products, services, and business models of existing businesses rather than introduce truly novel innovations (Reynolds, 2005; Shane, 2008). Data from the Global Entrepreneurship Monitor on over 100,000 early-stage entrepreneurs, for instance, showed that less than 5 percent of the sample introduced products or services that were new to the market place (Minniti, Bygrave, & Autio, 2005).

Taken together, these empirical observations underscore that only a small percentage of all new ventures demonstrates strong growth potential. Creative destruction by entrepreneurs who commercialize path-breaking technologies appears a relatively rare event, yet constitutes a critical source of economic growth and innovation. An important research question in the field of entrepreneurship thus concerns what factors enhance the performance of innovative ventures that pioneer new technology industries.

**Strategic Entrepreneurship and the Resource-Based View**

The relative scarcity of innovative, fast growing new ventures combined with their economic significance has stimulated a burgeoning stream of research exploring the determinants of new venture performance outcomes (see for recent reviews Gilbert, McDougall, & Audretsch, 2006; Song et al., 2008). This line of research is distinct from more general work on firm performance, because ‘whereas the growth of established firms is about sustaining viability, new venture growth is about obtaining viability’ (Gilbert et al., 2006: 927). Compared to more
mature organizations, new firms face important liabilities of newness and smallness that make them much less likely to survive and grow (Carroll, 1983; Stinchcombe, 1965).

Although entrepreneurs engage in many activities that are directed towards developing a viable business venture, three entrepreneurial processes seem particularly critical (Carter, Gartner, & Reynolds, 1996; Elfring & Hulsink, 2003): identifying opportunities, mobilizing resources, and building legitimacy. The discovery of new opportunities generally forms the very starting point of new venture creation and continues to be important for refining the firm’s business model. The subsequent exploitation of opportunities is, however, often hampered by a lack of adequate and sufficient resources (Katz & Gartner, 1988). While resource needs are high, new firms generally do not have the capability to generate these internally from existing operations. External resource acquisition is also difficult, as new ventures often lack legitimacy among potential resource providers (Aldrich, 1999). Due to the limited track record of the entrepreneur and his venture, potential customers, suppliers, and other stakeholders in the environment are reluctant to commit resources to the new business startup (Zimmerman & Zeitz, 2002).

Collectively, the three entrepreneurial processes of opportunity recognition, resource acquisition, and legitimization may result in a fledgling new enterprise. But what makes some new ventures much more successful than others? Prior research has identified numerous factors that influence the performance of new ventures including the characteristics of the entrepreneur, the resources and strategy of the new venture, and the nature of the external environment (Baum, Locke, & Smith, 2001; Brüderl, Preisendörfer, & Ziegler, 1992). Scholars have particularly noted that firms must engage in strategic entrepreneurship and simultaneously demonstrate opportunity-seeking and advantage-seeking behaviors in order to realize superior performance (Hitt et al., 2001; Ireland, Hitt, & Sirmon, 2003). New ventures generally excel at identifying entrepreneurial opportunities, but often lack the complementary resources that are necessary to appropriate value from exploiting those opportunities (Teece, 1986).

The strategic entrepreneurship perspective (Hitt et al., 2002; Ireland et al., 2003) is grounded in the resource-based view (RBV), which assumes that (1) firms own or control idiosyncratic bundles of resources and (2) this resource heterogeneity may persist due to imperfect resource mobility (Barney, 1991; Wernerfelt, 1984). According to the RBV, resources involve the (in)visible assets a firm uses to design and implement its strategies. Resources may contribute to a firm’s competitive advantage when they are valuable (i.e., enhance the firm’s efficiency or effectiveness) and rare (i.e., limited in supply). When the firm’s resources are also difficult to imitate (i.e., immobile) and cannot be purchased on factor markets (i.e., nonsubstitutable) they can lead to sustainable competitive advantages (Barney, 1991). From a strategic point of view, then, new ventures obtain superior
performance when they strategically manage their resources to enact both opportunity- and advantage-seeking behaviors (Ireland et al., 2003).

Entrepreneurship scholars drawing from resource-based theory have identified various resources that influence new venture performance including the important role of financial, human, and technological resources (Alvarez & Busenitz, 2001). Yet consistent with the broader RBV literature, this line of work has mainly focused on the internal resources and capabilities that are owned or controlled by the firm at the expense of considering the possibility that firms may also draw upon external resources that are located outside firm boundaries (Dyer & Singh, 1998). Recent work in the strategy and entrepreneurship fields has begun to address this limitation of the RBV by studying the important role of interorganizational network relationships as a source of competitive advantage (Galaskiewicz & Zaheer, 1999; Gulati, Nohria, & Zaheer, 2000; Lavie, 2006). This stream of research has argued that firms not only earn Ricardian rents and quasi-rents (Peteraf, 1993) from their internal resources, but may also obtain relational rents (Dyer & Singh, 1998) from their embeddedness in interfirm networks. Thus, recent research has argued that in order to more fully understand the determinants of superior new venture performance, the unit of analysis must be expanded beyond the firm-level to include the resources that may be embedded in a firm’s network of external relationships. In the present dissertation, I build on these ideas and combine RBV and social network theories to explain performance heterogeneity across new technology ventures in an emerging industry.

The Social Network Perspective

Social networks can be defined as ‘a set of nodes (persons, organizations) linked by a set of social relationships (friendship, transfer of funds, overlapping membership) of a specified type’ (Laumann, Galaskiewicz, & Marsden, 1978: 458). A central premise underlying social network theory involves the notion that actors are embedded in ongoing structures of interpersonal relations that provide opportunities for and constraints on economic action (Granovetter, 1985; Uzzi, 1996). Unlike traditional supply- and demand-based perspectives that have conceptualized entrepreneurs as either rational, autonomous actors or as “cultural dopes” without agency (Thornton, 1999), the network perspective maintains that ‘entrepreneurship is embedded in a social context, channeled and facilitated or constrained and inhibited by people’s positions in social networks’ (Aldrich & Zimmer, 1986: 4). In fact, some have argued that the very essence of entrepreneurship involves building bridges between previously disconnected social circles (Burt, 1992; Schumpeter, 1934). These “network entrepreneurs” (Burt, 2005: 228) create valuable new combinations of existing resources that are unevenly distributed across separate groups.

Recent research has shown that individuals and organizations may secure significant strategic advantages from their embeddedness in social networks (see
for reviews Brass et al., 2004; Dacin, Ventresca, & Beal, 1999). These instrumental benefits have been labeled “social capital” (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998) and stem from the idea that networks channel resource flows among actors in a social system. Thus to the extent that entrepreneurs vary in the extent to which they occupy strategic network positions (i.e., those that are valuable, rare, inimitable, and nonsubstitutable), the social network perspective provides a powerful theoretical lens with which to explain persistent performance differences among new ventures.

An important issue in studying entrepreneurial networks concerns the choice of an appropriate level of analysis (Hoang & Antoncic, 2003). In the current study, the unit of analysis is the new venture and its set of direct and indirect network relationships to other actors in the environment. The most important network ties of the new firm generally consist of the personal networks of the entrepreneur, defined as the individual(s) who have founded the business and interact with other parties on its behalf (Larson, 1992). As the venture evolves, however, it may also develop various interfirm relationships including marketing and technology alliances (Lechner & Dowling, 2005). In this regard, Hite and Hesterly (2001: 278) argue that ‘during emergence, the social network of the entrepreneur is virtually synonymous with the firm’s network’ but that ‘as a firm formalizes interpersonal network ties through routines and procedures, these ties may shift to become interorganizational ties’ (Hite & Hesterly, 2001: 278). Given this duality in levels of analysis, the current study will consider both types of ties simultaneously.

Previous research on networks and entrepreneurship has maintained that networks play a critical role in the entrepreneurial process because they provide entrepreneurs with access to strategic resources that facilitate the discovery and exploitation of opportunities (see for recent reviews Hoang & Antoncic, 2003; Street & Cameron, 2007; Stuart & Sorensen, 2008). These resources include knowledge and information, financial and human capital, and legitimacy (Elfring & Hulsink, 2003).

First, social networks represent conduits of private information that assist entrepreneurs in locating and evaluating new opportunities (Fiet, 1996). Networks reduce uncertainty surrounding the new venture and enrich its knowledge base through interorganizational learning processes (Powell, Koput, & Smith-Doerr, 1996). In one of the first studies in the field, Birley (1985) found that entrepreneurs relied primarily on informal ties with family, friends, and colleagues for information and advice regarding their business ventures. More recently, Ozgen and Baron (2007) reported that entrepreneurs’ participation in informal industry networks positively influenced their recognition of opportunities. Second, network ties aid entrepreneurs in mobilizing the resources that are needed to exploit entrepreneurial opportunities (Elfring & Hulsink, 2003). Social ties to potential resource providers engender trust and thus help new ventures to secure resources at relatively low cost. Shane and Cable (2002), for example, demonstrated that entrepreneurs with prior social ties to venture capitalists have a significantly
higher chance of acquiring financial capital. Similarly, Leeung et al. (2006) found that social networks play a critical role for new ventures in acquiring human resources. Third, relationships to prominent actors provide new ventures with valuable endorsements that increase their legitimacy in the market place (Stuart, Hoang, & Hybels, 1999). Entrepreneurs generally lack an established track record, but may gain credibility by “piggy-backing” on the legitimacy of established organizations (Starr & MacMillan, 1990). Stuart et al. (1999), for example, demonstrated that new ventures with prominent alliance partners go to IPO faster and earn greater valuations after IPO than ventures without such endorsements. Along similar lines, a study by Burton, Sorenson, and Beckman (2002) found that entrepreneurs with affiliations to prominent prior employers were more likely to identify innovative opportunities and acquire financing.

In an effort to generate an understanding of how the social context in which a new venture is embedded shapes its performance, network scholars have identified three distinct dimensions of a focal firm’s network—network structure, tie modality, and network composition—that influence the value the firm derives from that network (Gulati, Dialdin, & Wang, 2002; Nahapiet & Ghoshal, 1998). These dimensions provide a broad representation of network performance effects and cover multiple levels of analysis (i.e., network, dyadic, and alter level).

First, network structure refers to the overall pattern of network ties and the firm’s position within this structure. Studies adopting this perspective have focused on the role of a firm’s centrality within the overall network structure as an indicator of access, timing, and control advantages (e.g., Powell et al., 1996). Zooming in on the local network neighborhood, this line of work has also examined how the presence or absence of linkages among a firm’s direct network contacts affects its performance (e.g., McEvily & Zaheer, 1999). Second, tie modality involves the strength and content of a firm’s network ties. Studies in this tradition have stressed the differential value of weak and strong ties, noting that the former facilitate search for novel resources while the latter enable the transfer of those resources (e.g., Elfring & Hulsink, 2003). This stream of research has also observed that firms are embedded in multiple networks of different contents, ranging from friendship and membership ties, to alliances and joint ventures that may generate distinct performance effects (e.g., Lechner, Dowling, & Welpe, 2005). Third and finally, network composition refers to the characteristics of a focal firm’s network contacts. Research on this dimension has emphasized the importance of considering the quality and heterogeneity of the resource endowments of a focal firm’s network partners such as their knowledge assets, status, and network connections (e.g., Baum, Calabrese, & Silverman, 2000; Stuart, 2000).

1.3 RESEARCH PROBLEM AND QUESTIONS

So far my analysis has concentrated on the positive role of social networks in the entrepreneurial process, thus viewing external relationships as a source of
TABLE 1.1
Significance of and Criticism on Social Network Research in Entrepreneurship

<table>
<thead>
<tr>
<th>Author(s)</th>
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<tbody>
<tr>
<td>Stuart and Sorensen (2008:215)</td>
<td>‘Based on our reading of the literature, there is little doubt that entrepreneurship scholars believe that heterogeneity in social capital endowments give rise to performance differences across firms. The preponderance of evidence supporting this contention provides a prima facie case for placing the study of social networks front and center in research on strategic entrepreneurship.’</td>
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<td>Watson (2007: 854)</td>
<td>‘Although the arguments in favor of networking appear compelling, and most of the existing literature is premised on the belief that networking is beneficial, there has been little empirical evidence to date of an association between firm performance and the owner’s use of networks.’</td>
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<td>Stuart and Sorensen (2005:226)</td>
<td>‘Much of the work in the field of entrepreneurship per se merely invokes the metaphor of a network—very little of this research systematically deploys the theory and methodology that has been developed in sociology. In this regard, we see a tremendous opportunity for research on networks and entrepreneurship.’</td>
</tr>
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<td>Burt (2000: 372)</td>
<td>‘Although entrepreneurship is inherently an exercise in the social capital of structural holes, the topic remains virtually untouched by theory and empirical research on the network forms of social capital. This is an area ripe for study with advances in network theory and analysis.’</td>
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<td>Elfring and Hulsink (2003: 409)</td>
<td>‘Although the value of networks as an integral part of the explanation of entrepreneurial success is widely acknowledged, there is considerable confusion and disagreement as to the role particular network characteristics play in the performance of emerging firms.’</td>
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<tr>
<td>Hoang and Antoncic (2003:172)</td>
<td>‘Because identifying and exploiting opportunities are explicitly linked to occupying the bridging position in a network, this structurally based theory has intriguing possibilities for entrepreneurial research.’</td>
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<td>Simsek, Lubatkin, and Floyd (2003:428)</td>
<td>‘While a growing number of researchers recognize the important role that inter-firm networks play in promoting entrepreneurial activities, their explanations make only indirect reference to the nature of ties a firm may have in a network, how those ties may fit together, and the effects of such ties on firm behavior.’</td>
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<td>Hite and Hesterly (2001: 275)</td>
<td>‘Clearly, broad agreement exists about the importance of networks for emerging firms, but there is considerably less agreement as to what network characteristics are most advantageous in a firm’s early stages.’</td>
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<td>Schoonhoven and Romanelli (2001:386)</td>
<td>‘Although more research is needed to understand the role of entrepreneurial networks in the success or survival of new organizations, it should be taken for granted in today’s theory that the singular resources of isolated individuals, no matter how impressive, are rarely sufficient to meet the challenges of organization creation. It takes a collective.’</td>
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<tr>
<td>Steier and Greenwood (2000:163)</td>
<td>‘Despite appreciation of networks as integral to entrepreneurial success, theoretical development remains unfinished. There is little specification of the various dimensions of a network or of their impact upon the development of a new venture.’</td>
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<td>Brüderl and Preisendörfer (1998: 213)</td>
<td>‘There is plenty of empirical evidence that illustrates the importance of social ties in the formation and maintenance of new enterprises. Nevertheless, …the discussion about networking of entrepreneurs uses the language of social networks, but very seldom the real concepts and statistical tools of general network analysis are employed.’</td>
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<td>Dubini and Aldrich (1991: 305)</td>
<td>‘“Networking” may result in a time-consuming and fruitless effort…it thus becomes necessary to specify the conditions under which networking contributes to business effectiveness, and to link it to the contingencies facing firms.’</td>
</tr>
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</table>
social capital that has great strategic value for new ventures. Yet as revealed by the quotes in Table 1.1, scholars have recently noted that our understanding of network effects on the emergence and growth of entrepreneurial firms still remains limited. As noted by Uzzi (1997: 35), ‘the fundamental statement that economic action is embedded in ongoing social ties that at times facilitate and at times derail exchange suffers from a theoretical indefiniteness’, because ‘it does not explain concretely how social ties affect economic outcomes’ (Uzzi, 1996: 674). Recent theoretical development has addressed this issue by explicating the dimensions of social structure that influence organizational performance. However as Adler and Kwon (2002: 23) observe, ‘considerable disagreement and confusion exist concerning the specific aspects of social relations that create social capital.’ Whereas some scholars have focused on the role of network structure (Burt, 1992; Coleman, 1988), others have emphasized the importance of considering the strength and content of the relationships (Granovetter, 1973; Uzzi, 1997) or the resources embedded in the network (Baum et al., 2000). This line of research has also identified important trade-offs with regard to each of these dimensions including the relative advantages and disadvantages of sparse vs. cohesive network structures (e.g., Rowley, Behrens, & Krackhardt, 2000), weak vs. strong ties (e.g., Uzzi, 1997), and heterogeneous vs. homogeneous network compositions (e.g., Sampson, 2007). Yet as noted by Shipilov (2006: 590) ‘evidence remains mixed on which particular patterns of interorganizational relationships are advantageous for firms’. To reconcile these divergent views, researchers have recognized that networks may also have a “dark side” and that networks entail significant costs, risks, and difficulties that may eventually outweigh the benefits associated with those networks (Gargiulo & Benassi, 2000; Hansen, Podolny, & Pfeffer, 2001). Grounded in the premise that ‘the optimal structural design is contingent on the actions that the structure seeks to facilitate’ (Ahuja, 2000a: 452), scholars have recently begun to explore the conditions that shape the effects of particular network configurations on performance outcomes of entrepreneurial firms (e.g., Ahuja, 2000a; Hite & Hesterly, 2001; Maurer & Ebers, 2006; Rowley et al., 2000).

An issue related to the above involves the question of how entrepreneurs may actually obtain the network positions that confer strategic advantage. In his seminal article, Stinchcombe (1965) noted that an important disadvantage of new ventures compared to mature organizations is their lack of established network relationships. Thus, a critical challenge for new ventures involves overcoming this “liability of unconnectedness” (Powell et al., 1996: 143) by forging strategic linkages to key actors in the environment. Previous research has identified both exogenous and endogenous factors that shape interfirm tie formation (Ahuja, 2000b). Exogenous factors involve firms’ inducements to create ties resulting from resource dependencies (Pfeffer & Salancik, 1978) or institutional demands (DiMaggio & Powell, 1983), while endogenous factors encompass the tie formation opportunities provided by a firm’s position in the prior network structure (Gulati
& Gargiulo, 1999). Yet while these factors may explain variation in network positions across firms that are already embedded in the network, they ‘cannot explain how firms gain access to alliance networks without having already established a position in these networks’ (Rosenkopf, Metiu, & George, 2001: 748). That is, more research is needed on how new ventures may create opportunities for establishing ties, especially given the paucity of research on network antecedents (Brass et al., 2004).

Based on the above, the research problem of this dissertation is defined as:

*How do social networks influence the performance of new ventures in an emerging industry and how can these ventures establish favorable network positions?*

To investigate this research problem, an integrative research framework has been developed that addresses three emerging research themes in the literature on entrepreneurship and social networks. As shown in Figure 1.1, these themes include the role of network antecedents, network configurations, and firm-level contingencies in shaping new venture performance outcomes. Below I discuss the specific research questions underlying each of the three themes in more detail and demonstrate how and where they are addressed in the present dissertation.

**Theme I: Network Antecedents**

Borgatti and Foster (2003: 1000) recently noted that ‘the bulk of network research has been concerned with the consequences of networks.’ The field of entrepreneurship studies is unfortunately no exception to this trend and, as a result, our understanding of how entrepreneurs may develop favorable network positions remains limited (Elfring & Hulsink, 2007; Hoang & Antoncic, 2003). In this respect Burt (2005: 28) concluded that ‘brokerage creates an advantage, but we know little about how people come to be brokers.’ An emerging research theme therefore involves uncovering the factors that facilitate social capital development among emerging entrepreneurial firms (Maurer & Ebers, 2006).

Prior research on network antecedents has highlighted the role of firms’ strategic motivations and prior collaborations in explaining the formation of new interfirm alliances (Ahuja, 2000b; Gulati & Gargiulo, 1999). However, in new technology industries such alliance networks have yet to emerge (Walker, Kogut, & Shan, 1997), thus pointing to the need to understand what drives the formation of informal social networks among entrepreneurial firms in emerging industries (Luo, 2003) and how new ventures may establish strategically advantageous positions within those networks (Stuart & Sorensen, 2008). Empirical evidence has suggested that informal ties are an important precursor to the formation of formal ties (Rosenkopf et al., 2001) and have important consequences for the strategic choices and performance of firms (Geletkanycz & Hambrick, 1997), but few if any studies have examined the factors that explain variation in the structural positions
of firms within informal industry networks. Westphal, Boivie, and Chng (2006: 443) indeed argue that ‘there is a need for systematic research that examines the determinants of social network ties and the role of individual agency in building and maintaining such ties.’ Given this important knowledge gap, the first research question underlying this dissertation is:

*How can new ventures obtain structurally advantageous positions in the informal networks of an emerging industry?*

In Chapter 2 of this dissertation, I address this research question by focusing on the role of entrepreneurs’ networking activity at industry events (e.g., conferences, seminars) in shaping the nature of their network positions in informal industry networks. Specifically, this chapter builds on Aldrich and Fiol’s (1994: 654) contention that ‘new-to-the-world innovations tend to be pursued by a
handful of parallel, independent actors who come to know one another rapidly through personal interaction and through traveling in similar social/technical circles, such as attending the same industry conferences. The core argument of the study is that industry events represent “social foci” (Feld, 1981) that structure the development and patterning of social networks among entrepreneurs, implying that the frequency and pattern of entrepreneurs’ event participation may explain differences in the size and structure of their social networks.

**Theme II: Network Configurations**

In their quest for network characteristics that maximize firm performance, scholars have documented the relative advantages and disadvantages of alternative network designs such as sparse vs. cohesive structures (Burt, 1992; Coleman, 1990), weak vs. strong ties (Granovetter, 1973; Uzzi, 1997), and heterogeneous vs. homogeneous compositions (Baum et al., 2000; Sampson, 2007). Yet the literature has tended to either examine these alternative designs ‘separately, or to pit the two in a “horse race” to see which is a better predictor’ (Oh, Chung, & Labianca, 2004: 870). The problem with these approaches is that (1) they limit our understanding of true network effects since observed effects may be caused by unobserved network dimensions and (2) they fail to consider the possibility that network dimensions are interdependent and may act as complements or substitutes (Mehra et al., 2006).

The first problem highlights the importance of adopting an integrative approach that simultaneously considers multiple network dimensions including network structure, tie modality, and network composition (Leana & Pil, 2006). For instance, by including both network structure and composition in an empirical test, we may disentangle “structural effects” from “resource effects” on performance (Rodan & Galunic, 2004). The second problem signifies the value of taking a configurational perspective on networks and social capital (Oh et al., 2004), which involves examining the interactions between different network dimensions or types of ties. Tiwana (2008) highlights the importance of this approach by stating that an emerging stream of research ‘recognizes that the optimal network configurations combine seemingly conflicting elements of both cohesion and range, proximity and diversity, strong and weak ties, and cohesion and structural holes.’ Similarly, Gulati et al. (2002: 299) note that ‘to truly comprehend the process of value creation through networks, we must understand how the different aspects of the network...independently and simultaneously impact firm behavior and performance.’ Considering network configurations allows researchers to not only explicate trade-offs between alternative network designs, but to also examine possible ways in which these network dilemmas can be reconciled. For instance, new ventures may face a trade-off between developing network ties within or outside their industry. A configurational perspective enables scholars to resolve this dilemma by examining whether both types of ties
are complementary or redundant. Thus, the second research question underlying this thesis is:

\[ \text{How do configurations of different network dimensions and types of ties influence the performance of new ventures in an emerging industry?} \]

This research question is addressed in Chapters 3 to 6 of this dissertation. In these chapters, I investigate configurations of multiple network dimensions (i.e., network structure, tie modality, and network composition) and configurations of multiple types of ties including intraindustry relationships, extraindustry bridging ties, institutional ties, and electronic relationships. Specifically, in Chapter 3 I examine new ventures’ network configurations in terms of the balance between their centrality within informal industry networks and range of bridging ties outside the industry. Next, Chapter 4 examines the interactions between the composition of a new venture’s network and its structural and relational dimensions. Then, in Chapter 5 I differentiate between four distinct brokerage strategies that are derived from different configurations of ties to firms’ task environment and institutional environment. Finally, Chapter 6 studies the configuration of firms’ electronic relationships to open source communities and their social (“offline”) ties to the local open source community.

**Theme III: Firm-Level Contingencies**

Following the mixed evidence that has been generated by studies seeking to uncover universally optimal network designs, recent research has adopted a contingency perspective to unravel the conditions under which particular network characteristics enhance or constrain organizational performance. Given that building and maintaining networks involves significant costs and risks (Hansen et al., 2001), scholars have noted that we need ‘research that further explores the contingencies under which social capital becomes an asset or a liability’ (Maurer & Ebers, 2006). The contingency approach acknowledges that firms differ in their resource needs so that ‘not all ties are equally beneficial for all firms’ (Peng & Luo, 2000: 488). Moreover, this line of research has considered the possibility that not all firms possess the internal resources and capabilities that are necessary to utilize the resources that are available through their networks (Lee, Lee, & Pennings, 2001). That is, networks provide potential access to valuable resources, but firms vary in their ability to exploit those resources (Zaheer & Bell, 2005). Yet despite the realization that social capital has contingent value (Burt, 1997), Shipilov (2006: 590) recently concluded that ‘there is little research in the interfirm networks literature about firm-level characteristics that can determine whether or not firms can reap performance benefits from their network positions.’ Given this important knowledge gap, the third research question that will be examined in this dissertation is defined as:
How does the nature of a new venture’s strategy and resources influence the relationship between particular network configurations and performance?

This research question is addressed in Chapters 3, 5, and 6 of this dissertation. In Chapter 3, I build on recent work in the strategy and entrepreneurship literatures that has shown the importance of entrepreneurial orientation for firm performance (Lumpkin & Dess, 2001; Wiklund & Sheperd, 2005) by proposing that fit among a venture’s entrepreneurial posture and social capital is positively related to its performance. Next, I examine the moderating role of founders’ prior career experiences in Chapter 5. In this chapter, I build on the idea that inexperienced entrepreneurs face more severe legitimacy problems and argue that their firms therefore obtain more benefits from interorganizational endorsements. Finally, in Chapter 6 I build on the notion of absorptive capacity (Cohen & Levinthal, 1990) by proposing that the presence of strong internal technological resources enable a firm to extract more value from its relationships with open innovation communities.

1.4 RESEARCH CONTRIBUTIONS

This dissertation contributes to three bodies of literature. First, the current study contributes to interorganizational network research by advancing a configurational perspective on social capital (cf. Mehra et al., 2006; Oh et al., 2004) that addresses the interactions among different network dimensions and types of relationships, as well as the contingencies that determine the optimal configuration of ties. Although previous research has examined the role of network structure, tie modality, and network composition in shaping firm performance (Gulati et al., 2002), few studies have analyzed the joint effects of these network dimensions on organizational outcomes (Shipilov, 2006). Moreover, previous work has mainly concentrated on organizational embeddedness in a single network, thereby ignoring the possibility that firms are embedded in multiple types of relationships (Zaheer & Bell, 2005). By demonstrating how important network dilemmas that have been explicated in previous research (e.g., centrality vs. bridging ties, heterogeneous vs. homogeneous network compositions) can be better understood by taking a configurational approach, this study extends recent efforts to reconcile seemingly conflicting perspectives on optimal network design for entrepreneurial firms (Tiwana, 2008).

Second, by demonstrating how the network position of new ventures in the social structure of an emerging industry influences their performance, this study links recent theoretical and methodological advances in social network research to the entrepreneurship literature. Specifically, previous research on entrepreneurial networks have relied on egocentric network data that only capture the direct ties among a focal entrepreneur and his/her network contacts (Burt, 2005). Only very little is known about how the indirect ties of entrepreneurs and their positions in
the overall network structure of their industry impact new venture performance outcomes (Stuart & Sorensen, 2005). Moreover, prior studies have mainly focused on entrepreneurship in established industries, so that understanding of the factors influencing new venture success in nascent industries remains limited (Low & Abrahamson, 1997). Industry pioneers increase organizational diversity and rejuvenate declining industrial sectors, but face significant knowledge and legitimacy barriers (Aldrich & Martinez, 2001). The current study makes a contribution by collecting an original dataset of the entire network structure of informal ties among new ventures in the emerging open source software industry in the Netherlands.

Third, this study contributes to the small, but rapidly growing literature on open source software (Von Hippel & Von Krogh, 2003; Von Krogh & Von Hippel, 2006) and open innovation (Chesbrough, 2003) by empirically examining how and when the participation of firms in open source communities influences their performance. Prior research in this area has mainly concentrated on the motivations of individuals to become involved in open source projects at the expense of considering the participation of commercial actors in open innovation communities (Dahlander, 2007). By examining how community participation is related to firm performance and how firm-level characteristics moderate this relationship, this study refines our understanding of the boundary conditions under which participation in open innovation communities is beneficial to the performance of firms pursuing open business models.

1.5 RESEARCH APPROACH

The current study employed a single-industry, multimethod longitudinal research design in order to address the research problem and questions that were formulated in section 1.3 of this chapter. A within-industry approach is beneficial since it allows researchers to identify the resources that are critical to the industry in question (Hoskisson et al., 1999) and to collect ‘more fine-grained network data including data on indirect ties’ (Hoang & Antoncic, 2003: 177). Although multi-industry studies may lead to greater generalizability of the empirical findings, it would be practically impossible to obtain primary data on the entire structure of informal ties among firms in multiple industries. Thus consistent with prior research (e.g., Zaheer & Bell, 2005), I utilized a single-industry design to examine the influence of industry network structure and firm-level characteristics on performance.

Specifically, the research setting of the current PhD study was the emerging open source software industry in the Netherlands. Open source software refers to software that is freely accessible to all who wish to modify its “source code.” It involves a public good that is typically created within online developer communities where knowledge and innovations are shared among globally distributed individuals (Von Krogh & Von Hippel, 2006). Famous examples of
open source software products include the operating system Linux, the Firefox web browser, and the Apache web server. Given that scholars have been puzzled by the success of open source software communities as an institutional alternative to firm-based innovation (Kogut & Metiu, 2001), the turn of the century has witnessed a rapidly growing stream of research on open source software (see for instance the special issues on the topic in journals like Research Policy (Vol. 32, No. 7) and Management Science (Vol. 52, No. 7)). Moreover, open source software has also received significant attention from entrepreneurs who pursue new business opportunities related to open innovation (Chesbrough, 2003). As noted by Bonaccorsi, Giannangeli, and Rossi (2006) and Dahlander (2007), during the past decade many new ventures have emerged that pursue an open source business model by selling open source software products and services. These ventures differ from traditional software firms, because they rely on participation in developer communities for access to critical resources, employ open instead of proprietary technologies, and generate revenues from selling complementary products and services rather than from license fees. In the Netherlands the open source software industry is still in emergence, with many young and small firms as well as various nonprofit organizations and government agencies, involved in the commercialization of open source software. Because of its relatively small size and nascent character, the Dutch open source software industry provided a unique setting in which to examine the research problem and questions underlying this dissertation. The modest size of the industry yielded a rare opportunity to map the complete network structure of ties among all firms in the industry. Moreover, firms in this nascent field faced many challenges associated with industry emergence. Previous work has underscored the importance of social networks for new ventures operating in emerging markets where knowledge and legitimacy are still underdeveloped (Galaskiewicz & Zaheer, 1999), yet most research has focused on established industries (Aldrich & Fiol, 1994).

Multiple methods were used to collect both qualitative and quantitative data from a variety of sources. Such hybrid research designs facilitate the triangulation of evidence obtained from different methods and sources (Eisenhardt, 1989), thereby increasing the robustness and generalizability of the findings (Jick, 1979) and reducing the possibility of generating common method variance (Podsakoff, MacKenzie, & Lee, 2003). Qualitative data was collected to generate an understanding of the research setting, to increase the rationale for hypothesized relationships, and as input for questionnaire development. Quantitative data was then used to examine the hypothesized relationships among the constructs and to enhance the generalizability of the results (Scandura & Williams, 2000).

The research approach of the present study can be divided into three stages. In stage one, I reviewed the literature on social networks and entrepreneurship in order to evaluate the state of prior research. This analysis facilitated the identification of important theoretical constructs and relationships, an assessment of existing empirical evidence, and the recognition of unanswered research
questions. Reviewing prior work constitutes an important first step, because any research design must fit the stage of development of the current literature at time of the study (Scandura & Williams, 2000). The analysis indicated the presence of a rather well-established body of research including previously developed constructs and measures. Yet the review also detected mixed empirical support for certain hypothesized relationships, revealed several neglected themes, and uncovered some methodological limitations. These observations suggested that research questions needed to focus on elaborating, clarifying, and extending existing theory by means of a hypothesis-testing approach. In order to develop new theoretical propositions, I relied not only on prior research but also on qualitative data obtained from interviews with industry experts (Kumar, Stern, & Anderson, 1993). These interviews allowed me to develop an understanding of the research setting and gain new insights into the relationships among the constructs (Eisenhardt, 1989).

The second stage of the research project involved the development of a survey instrument, the collection of quantitative data, and the analysis of this data using multivariate statistical techniques. Qualitative data obtained from industry experts combined with previously used instruments formed the input for the development of the survey. Whenever available, previously developed measures were used so as to increase the comparability of the findings to previous work. I also closely followed Dillman’s (2000) procedures and suggestions regarding survey design in order to enhance the quality of the survey and increase response rates. Following the completion of the design and pretesting phases, quantitative data was collected through a two-wave survey that was administered with the entrepreneurial teams of each of firm in the industry (please refer to the appendix for the precise survey items). The first survey included conventional items pertaining to individual-level and firm-level constructs, as well as sociometric questions that captured the relational constructs of interest. The follow-up survey was administered to the same respondents and contained mostly performance-related items. In order to also map the network ties among the government and nonprofit organizations in the industry, a survey containing only sociometric questions was administered with the project leaders and board members of these organizations. Following data collection, hypotheses were tested using multivariate statistical techniques including OLS, mediated, moderated, and negative binomial regression models (Aiken & West, 1991; Baron & Kenny, 1986; Cameron & Trivedi, 1998). To construct the network measures, I relied on social network analytic techniques (Wasserman & Faust, 1994).

The final stage of the research project entailed interpreting the main empirical findings. To generate a better understanding of the study’s results, I not only relied on theory and previous empirical findings reported in the literature, but also on feedback from entrepreneurs that participated in the research. In so doing, surprising results could be discussed as well as their practical implications.
1.6 CHAPTER OVERVIEW

In this section I elaborate on the specific contents of the empirical chapters of this dissertation, paying attention to the particular research question that each chapter seeks to answer and its key findings.

Chapter 2 examines the question of how entrepreneurs’ participation in industry events is related to the performance of their new ventures and whether this “networking effect” can be explained by the mediating role of social networks. That is, does networking at conferences and seminars directly affect new venture performance or does it result in the attainment of favorable network positions, which in turn influence new venture performance? Using a unique dataset of 45 industry events spanning a five year period, a central finding in the chapter is that frequency of event participation has a curvilinear relationship with venture performance and that entrepreneurs’ prominence in informal industry networks mediates this relationship.

Chapter 3 investigates how a new venture’s configuration of intra- and extraindustry ties interacts with entrepreneurial orientation (EO) in shaping its performance. Given resource limitations, a key question involves whether both forms of social capital are complementary or redundant and what configuration of ties is optimal for highly entrepreneurial firms. A key result in the chapter is that intraindustry network centrality in combination with limited bridging ties is negatively related to the performance of new ventures with a strong EO, while the reverse is true when entrepreneurs maintain extensive bridging ties.

Chapter 4 analyzes the conditions under which knowledge heterogeneity in a new venture’s external network enhances its innovativeness. Ties to firms with diverse knowledge may not only provide novel learning opportunities but also reduce a firm’s ability to absorb this external knowledge, thus raising the question how these absorptive capacity problems can be reduced. The chapter specifically examines how managerial social capital among a focal new venture and its network partners influences the relationship between knowledge heterogeneity and firm innovativeness. A central finding of this study is that while structural and relational social capital strengthen the positive effects of knowledge heterogeneity on firm innovation, cognitive social capital weakens these effects.

Chapter 5 expands the unit of analysis from a focus on interpersonal ties among new ventures commercializing open source software (Chapters 2-4) to the study of multiple types of ties among different organizational populations in the Dutch open source community. Specifically, this chapter examines how ventures’ embeddedness in collective action networks and institutional ties influences their performance. One key finding is that institutional linkages only enhance the performance of new ventures that have been founded by entrepreneurs with little prior career experience.

Chapter 6 shifts the unit of analysis from interfirm and institutional relationships towards the role of electronic relationships in shaping new venture
performance outcomes. The emerging literature on open source software has highlighted the potential value of a firm’s participation in online open source communities, yet no study has empirically examined whether these linkages contribute to the performance of new ventures that pursue an open source business model. The question addressed in the chapter involves under what conditions a firm’s community participation enhances its financial and innovative performance. A key result from this analysis is that firms’ participation in open innovation communities has a curvilinear relationship with performance and that this relationship is contingent on organizational size and absorptive capacity.

1.7 RELATED PUBLICATIONS

The findings from this dissertation have culminated in a number of international, peer-reviewed publications and conference presentations. An overview of this output is presented below, organized by empirical chapter.

Chapter 2


Chapter 3


Chapter 4


Chapter 5


Chapter 6
