

DYNAMIC ENTREPRENEURIAL NETWORKS: AN INVESTIGATION OF
ENTREPRENEURS, NEW VENTURES AND THEIR NETWORKS

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A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy
in the Department of Management
in the College of Business Administration
at the University of Central Florida
Orlando, Florida

Summer Term
2006

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ABSTRACT

Entrepreneurs need resources to organize new venture offerings into marketplace-acceptable forms. Entrepreneurs use others' assistance via networks to obtain these resources. Research indicates that firms face resource dependencies, that likely change over time, where they must respond to those controlling resources. Although some work has investigated implications of new ventures' networks at one time period, little work has investigated the dynamic nature and associated outcomes of networks as they change due to different resource requirements as the venture develops. This research examines the dynamic nature of networks, due different resource requirements over time, and how these changes impact entrepreneurial outcomes via interactions with entrepreneurs' existing networks. In order to account for the dynamic nature of entrepreneurial new ventures and their networks of resource providers, a model is presented that investigates antecedents to subsequent entrepreneurial network characteristics. The model also anticipates changes eminent to the founder as a consequence of interactions with their networks due to experiences associated with the new venture development process. This work relies on network theory integrated with resource dependence theory arguments, work that examines founder attributes as associated with entrepreneurial outcomes and research that investigates the stages of new venture development.

Predictions developed from the model were tested in two studies. The first study utilized the Panel Study of Entrepreneurial Dynamics, an existing panel database containing information about nascent entrepreneurs, as its data source to test predictions examining the dynamics of entrepreneurs' networks across two time frames. The second study used a cross-sectional mass

mail survey design to investigate all of the model's predictions on a random sample of newly incorporated firms in the state of Florida.

The results of the studies provided support for about one third of the predictions and there were a few contrasting findings across studies. Overall, the results of the studies suggest that some conceptualizations presented in the theoretical model should be reevaluated and that the applicability of some constructs when studying firms in the organizing stages of development should be reconsidered.

ACKNOWLEDGMENTS

I would like to thank Cameron Ford, Bruce Barringer, Marshall Schminke, and Stephen Sivo for their guidance, advice, encouragement, and direction throughout the dissertation process. I would also like to thank my committee and the other faculty members and advisors at the University of Central Florida who have taught me, mentored me, and helped me to become that which I have always dreamed.

I would also like to thank Randy Berridge, Carol Ann Dykes, Gordon Hogan, Tom O’Neal, Evelyn Ramirez, and everyone at the University of Central Florida’s Office of Research and Commercialization and the Florida High Tech Corridor Council, without whom this work would not have been possible. A special thanks also goes out to Shawn Weisfeld for his help and technological support.

Finally, and most importantly, I would like to thank my family. Without all of their love and support throughout the program and life my educational dreams and goals would not be a reality. Thank you to my husband, Jim Tramontana, for supporting and challenging me. And most importantly, thank you to my mother, Patricia Sullivan—for everything.

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CHAPTER 1: INTRODUCTION

Networks are a primary method through which resources, critical to entrepreneurial activity, are transferred (Hoang & Antoncic, 2003). Research leading to this understanding has studied a number of phenomena such as the types of resources received from network partners like tangible (e.g., capital resources) and intangible resources (e.g., emotional support, information and knowledge) (Bates, 1997; Brüderl & Preisendörfer, 1998; Birley, 1985; Singh, Hills, Hybels, & Lumpkin, 1999; Zimmer & Aldrich, 1987). Other work has examined the character of the networks through which resources are transferred. Two classes of characteristics of networks that have produced rather robust research results include the content of the network (e.g., the diversity of a network) and the structure of the network (e.g., the different positions of actors within a network) (Hoang & Antoncic, 2003).

In a recent review of the literature, Hoang and Antoncic (2003) state that most theoretical and empirical work studying networks in the context of entrepreneurship:

“seeks to understand: (1) how networks affect the entrepreneurial process and how they lead to positive outcomes for the entrepreneur or their firm (networks as independent variables) and (2) how entrepreneurial processes and outcomes in turn influence network development over time (networks as dependent variables)” [2003: 172].

They do, however, note, like others (cf., Borgatti & Foster, 2003), that an integration of these two network perspectives and a more detailed exploration of networks as dependent variables are lacking. More specifically, they call for an investigation of the “impact of entrepreneur attributes and [the] occurrence of entrepreneurial events on [the] quality of network linkages formed” and the “impact of entrepreneurial outcomes on network development processes” [2003: 179].

In order to address these gaps and to address an important issue within the literature more generally, the purpose of this dissertation is to develop a dynamic model of entrepreneurial networks over new venture emergence and early growth. Specifically, I will examine how, over time, entrepreneurs' networks interact with entrepreneurs' characteristics to influence entrepreneurial outcomes during new venture emergence and early growth. With regard to entrepreneurs' characteristics, I focus on the business-relevant knowledge held by the entrepreneur (knowledge sets). With regard to network characteristics, I focus on the knowledge in the entrepreneurs' networks (network *knowledge* sets) as well as network configurations (network *structure*) that should be helpful in gaining access to necessary knowledge.

Entrepreneurial outcomes of interest include marker events of the venture development process. More importantly, I also examine how the nature of the networks will change over time as a consequence of prior entrepreneurial outcomes and prior network linkages. Further, I will examine how entrepreneurs themselves will change as a result of their interactions with their networks over time and due to the new venture emergence and early development process.

The remainder of this chapter will proceed as follows. First, I provide a broad and general review of network theory. Within this general review, I will discuss the theoretical underpinnings of network theory, will review the main relationships of interest when studying networks within organizational settings (consequences and antecedents related to networks), and will define and discuss the main constructs of interest that have appeared within organizational studies of networks. Second, I will discuss the application of network theory within entrepreneurship research. In this discussion, I identify network-related constructs that have emerged as important within the work in entrepreneurship. Third, I will review the work studying dynamic entrepreneurial networks. This review will discuss the few papers that have

appeared on this topic and will highlight consistencies across these inquiries and identify important areas for improvement.

In general, during this literature review, I will highlight important relationships and variables that are applicable to the current inquiry. In Chapter Two I will explain my model of dynamic entrepreneurial networks and will develop propositions and hypotheses corresponding to the model. Chapter Three presents the results of two empirical studies testing the hypotheses developed in Chapter Two. Chapter Four concludes with a general discussion of the findings from the two empirical studies, their implications for practice and research, and a discussion of future directions for research studying dynamic entrepreneurial networks.

Literature Review

Before reviewing network theory, a few definitional clarifications are warranted. Within the context of this work, I adopt a well-accepted definition of *entrepreneurship* as

“... activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organizing, markets, processes, and raw materials through organizing efforts that previously had not existed (Venkataraman, 1997; Shane and Venkataraman, 2000)” (Shane, 2000: 4).

This definition is consistent with others within the entrepreneurship domain and I chose it specifically because it explicitly identifies new venture emergence and development at the center of entrepreneurship, a main concern for my work here.

I further define the *entrepreneur* as the individual, or founder, of a new business venture that had not previously existed (Shane, 2000). Although I recognize that new ventures can be founded by more than one individual, as in the case of a founding team, I restrict my theoretical development and operationalizations to include only a single, individual, entrepreneur. In cases

where there is a founding *team*, I define the entrepreneur as the individual with majority ownership (Hite, 2005). Thus, when I discuss the states of the entrepreneur, I intend this to apply to the relevant states of the individual entrepreneur based on the above classification. Even though I have made this distinction for expositional and methodological simplicity, it is easy to imagine that the relationships that I discuss could apply to groups beyond single entrepreneurs. Regardless, a discussion of my model that includes implications for a founding team or other organizational members is reserved for future research.

With regard to networks, I adopt a network perspective utilizing resource dependence arguments (Pfeffer, 1978; Pfeffer and Salancik, 1978) to define the entrepreneur's *network* as the individuals or firms with whom the entrepreneur interacts for obtaining resources (tangible and/or intangible) relevant to the new venture development. I include both formal (contract-based) and informal (not contracted-based) (Birley, 1985) relationships as part of the entrepreneur's network.

I now move to a review of network theory. I begin by discussing the emergence of network theory, which began within sociology. I then discuss how organizational theorists began to broadly integrate network theory into their thinking. I discuss the theoretical perspectives upon which network thinking within organizational studies is based: resource dependence theoryⁱ (Pfeffer & Salancik, 1978) and transaction cost economics (Williamson, 1975). I then highlight the main areas that have been covered within organizational studies utilizing network theory, to include the consequences, properties, and antecedents of networks as discussed in this broader work in organization theory and strategy. I focus on describing the main relationships that have emerged within the literature and highlight areas upon which my work contributes. Then, I discuss how entrepreneurship researchers, in taking from the work

within organization theory and strategy, have integrated network theory into their theorizing and studies. Specifically, I discuss how constructs emerging as important in organization theory and strategy have been applied within the entrepreneurship literature. I additionally highlight an emerging area of interest within work examining entrepreneurship and networks—dynamic entrepreneurial networks. Again, I highlight the main relationships that have emerged within the entrepreneurship literature and highlight areas where research is lacking. The purpose of this review is to set the stage for a discussion of the dynamic model of entrepreneurial networks presented in Chapter Two. Throughout the review, I will highlight important relationships that will serve as justification for parts of the model.

Theoretical Underpinnings of Network Theory

A network has been described as “a set of actors connected by a set of ties” [Borgatti & Foster, 2003: 992]. The *actors* within networks have been discussed at many levels of analysis to include individuals, teams, organizations, groups of organizations, etc. (Cook & Whitmeyer, 1992). The term *network ties* is used to describe the connection between actors within a network. Network ties have been primarily characterized through their relative structure, the nature of the connections, and the content (resources) provided by the ties (Borgatti & Foster, 2003; Hoang & Antoncic, 2003).

Interest in the study of networks emerged from work in sociology that examined the dyadic exchange relationships between actors (Blau, 1977; Cook & Emerson, 1978). This work was, at least initially, mostly concerned with identifying the character and resultant consequences of dyadic exchange relationships. As work in this area developed researchers began to expand their studies to include “more complex social structures called exchange networks” [Cook &

Whitmeyer, 1992: 113]. Subsequently, the theoretical and empirical work began investigating specific principles of exchange and power as they pertain to different kinds of network structures. Specifically, these works began studying the “relationship between types of exchange connections and the distribution of power and dependence among actors in various networks structures (e.g., Cook & Emerson, 1978; Cook, Emerson, Gillmore, & Yamagishi, 1983)” [Cook & Whitmeyer, 1992: 113]. These researchers viewed structural changes in network relationships as the result of social processes occurring due to a power imbalance between network relations (Cook & Whitmeyer, 1992).

Out of the work on networks in basic sociology emerged an interest for studying the nature of network relationships as they relate to organizations. Work in this tradition has been called the study of “organizational networks” (Gulati, Dyaldin, & Wang, 2002), “interorganizational networks” (Baker & Faulkner, 2002), “intraorganizational networks” (Raider & Krackhardt, 2002), and “organizational sociology” (Gulati & Gargiulo, 1999). As can be seen from the terminological differences used to describe the study of networks in organizational contexts, like sociology, networks within the administrative sciences has been studied at multiple levels of analysis.

Regardless of the level of analysis or terminology used, the work on networks within organizational settings has focused on answering issues related to how networks help firms manage uncertainty, generate efficiencies, obtain resources, and increase their power (the firms’) within their external environment (Bluedorn, Johnson, Cartwright, & Barringer, 1994). As such, to explain the existence of organizational networks and how they might help to achieve these ends, the initial work on networks in organizational settings relied on theoretical perspectives

such as resource dependence (Pfeffer, 1978; Pfeffer & Salancik, 1978) and transaction cost economics (Williamson, 1975) for explanations (Bluedorn, et al., 1994).

Resource Dependence Theory. Resource dependence theory (Pfeffer & Salancik, 1978) argues that firms intentionally respond to demands posed by important resource providers. Resource dependence theory also asserts that firms can attempt to manage their dependencies on resource providers via strategies that modify the control that resource providers have over the firms. Two actions are offered for managing these dependencies: 1) firms can obtain control over critical resources, consequently lessening their dependencies upon others, and 2) firms can obtain control over critical resources that others need, thus increasing others' dependence upon the focal firm. The "others" upon whom a firm can be resource dependent include any individual or firm upon whom they must rely for the resources they need. "These [resource providers] may be suppliers, competitors, creditors or any other relevant entity in a firm's external environment" [Bluedorn, et al., 1994: 227]. The resource dependence argument for how and why networks can help firms manage their resource dependencies is essentially that firms will establish network relationships with firms that 1) control critical resources and/or 2) with other dependent organizations. These actions are taken in hopes of lessening the relative power of the firms upon whom the focal firm is dependent (Bluedorn, et al., 1994).

In line with this reasoning, Gargiulo (1993) suggests that within organizations, leaders can establish networks with individuals that directly impact their performance within the firm. Gargiulo further proposes that in order to manage the power of these individuals, leaders can develop networks with others that can impact the performance of those upon whom they depend. Similarly, Hillman and Dalziel (2003), in their examination of boards of directors as network partners, contend that firms can manage their resource dependencies on their boards through 1)

appropriately compensating board members via equity, and 2) through creating or increasing the level of dependence of the board member(s) on the firm.

Transaction Cost Economics. Transaction cost economics (TCE) seeks to explain the organization of economic transactions due to efficiency concerns. “Transaction costs refer to the expenses involved in negotiating, implementing, and enforcing contracts” [Bluedorn, et al., 1994: 228]. In his original theoretical development, Williamson (1975; 1985) explained that economic efficiencies could be achieved through two different modes of organizing: markets or hierarchies. His later work recognized that organizational networks were a third potential form through which efficient economic transactions could occur (Williamson, 1991). Early work using a TCE perspective to explain networks argued that organizational networks are the most efficient form of organizing when “1) it is technologically more efficient to perform activities in more than one firm; and 2) when a network arrangement minimizes the transaction costs for participating firms (Jarillo, 1990)” [Bluedorn, et al., 1994: 228]. The work of Jarillo (1988) reiterates this notion. The fundamental TCE argument for organizational networks suggests that networks are utilized to increase the efficiencies of interacting with their environments and they are especially important when firms are engaging in risky and/or costly undertakings (Bluedorn, et al., 1994; O’Donnell, Gilmore, Cumming, & Carson, 2001).

As just discussed, the study of networks within organizational settings emerged primarily from work in sociology (Gulati & Gargiulo, 1999). Moreover, the bulk of the arguments for engaging in networks, either explicitly or implicitly, utilize some premises derived from resource dependence theory or transaction cost economics to explain their phenomenon. At this point in the exposition, it is appropriate to state that for the arguments I will present in my model of dynamic entrepreneurial networks, I will adopt a resource dependence focus for explaining the

evolution of networks over new venture emergence and early development. Specifically, I will utilize premises from resource dependence to argue that the dynamics of entrepreneurs' networks during venture emergence and early development occur to manage entrepreneurs' access to and control over needed resources. In utilizing a resource dependence focus, I do not assert that TCE is an inappropriate perspective from which to examine entrepreneurs' networks. Instead, the focus of my model is on the knowledge resources available within entrepreneurs' networks and so resource dependence is the more appropriate choice for this context. Having explained the theoretical bases of organizational network theory, I now move to a discussion of the main relationships (consequence and antecedents of networks) and constructs studied on organizational networks.

Building from the theoretical roots discussed above, organizational theorists and strategic management scholars began investigating the mechanisms that prompt organizations to become embedded within networks as well as the benefits to and governance mechanisms used by participants of a network (Blau, 1977; Burt, 1992; Granovetter, 1973; 1985; Pfeffer & Salancik, 1978). Even though this work has investigated both antecedents to and consequences of engaging in network relationships, the bulk of the work has focused on the consequences of network relationships (Borgatti & Foster, 2003; Gulati & Gargiulo, 1999; Hoang & Antoncic, 2003). Specific outcomes that these, appropriately termed, organizational sociologists have examined include gaining access to resources, both physical and informational (Burt, 1992; Granovetter, 1973; Gulati, et al., 2002), the management of resource dependencies (Pfeffer, 1972; Pfeffer & Salancik, 1978), and the attainment of organizational legitimacy or endorsements (Stuart, 2000).

Consequences of and mechanisms related to network relationships. With regard to consequences of network relationships, researchers have primarily identified the attainment of various resources, performance benefits, and the attainment of legitimacy as important outcomes. Specifically, researchers have cited informational benefits specifically related to novel and/or changing environmental or technological conditions as a benefit of engaging in some network relationships (Baum, et al., 2000; Burt, 1992; Dyer & Nobeoka, 2000; Granovetter, 1973). Others have linked participation in networks to the development of additional network linkages that might be useful for future firm development (Gulati, 1999; Gulati & Gargiulo, 1999). Similarly, some work has found an association between engaging in network relationships with the achievement of legitimacy for new firms within the marketplace (Ingram & Baum, 1997; Stuart, 2000). Others have linked the benefits of engaging in networks to gaining access to resources (Ingram & Baum, 1997) and performance outcomes of firms (Rowley, Behrens, & Krackhardt, 2000; Stuart, Hoang, & Hybels, 1999).

Organizational network researchers have utilized two perspectives or mechanisms through which they explain how networks can lead to the above mentioned consequences: the structuralist and connectionist perspectives (Borgatti & Foster, 2003).

The structuralist perspective. The structuralist perspective is by far the more researched of the two perspectives. The argument within this perspective explains that it is the configuration of network ties that determines the relative outcomes achieved from engaging in them. Structural properties researched primarily include constructs related to the location of actors within the network relative to one another. The main relationships that have been investigated under this perspective include: the *centrality* of a focal actor within their network,

the *size* of a focal actor's network, *cohesive* versus *bridging* ties, and the relative *strength* of ties (Gulati, et al., 2002).

Network *centrality* is used to describe the relative importance of the position held by an actor within the network (Freeman, 1979; Gulati, et al., 2002). Researchers describe three types of network centrality: closeness, betweenness, and degree centrality. *Closeness* centrality is defined as how close an actor is to the other actors within their network. More precisely, closeness centrality deals with how closely connected (directly or indirectly) an actor is in terms of easily being able to access others within the network. Network positions classified with high closeness centrality are associated with positive informational benefits and opportunity identification.

Betweenness centrality is associated with Burt's (1992) concept of structural holes. Essentially, betweenness centrality is defined as how frequently an actor falls between at least two other actors that are not connected with each other. Thus, the actor between the two other actors essentially acts as the "go between", connecting the other actors. Betweenness centrality is associated with power positions within a network, as high betweenness centrality actors can control the interactions between the unconnected actors.

Finally, *degree* centrality, also associated with the term network *density*, deals with how intensely involved an actor is within their network. Degree centrality is primarily investigated in terms of the *size* of a focal actor's network. Specifically, degree centrality, as operationalized by network size¹, refers to the total number of network partners in a focal actor's network. This research suggests that larger networks provide positive outcomes in terms of gaining resources

¹ It should be noted that researchers use network size as a proxy variable for degree centrality in that it somewhat accounts for the relative contacts that a focal actor has within a network. Size can give a rough indicator as to how many contacts within a full network an actor has, which is similar to the notion of degree centrality.

such as informational and technological benefits (Shan, Walker, & Kogut, 1994) and new, future, network partners (Gulati, 1999). Others have reported that network size, up to a point, is associated with more information and other positive outcomes like new product development but that after that point more partners could become problematic (Greve & Salaff, 2003; Deeds & Hill, 1996). Some argue that networks that are too large can be deleterious to actors who do not have the cognitive capacities or time to deal with all network partners. It should also be noted that although degree centrality seems to indicate the amount of information and other benefits that large networks can provide, this measure of centrality is considered somewhat limited as it does not indicate the relative benefits of specific ties within the network (Gulati, et al., 2002).

Cohesive and bridging network ties deal with the connections between actors within the network. *Cohesive* ties describe ties that link an actor with another actor in the network that has at least one other tie within the network. Cohesive ties are thought to be beneficial in that they are generally characterized by richly embedded and trustworthy relationships. As a result, cohesive ties are thought to provide focal actors with more and richer information. A downside, however, is that networks characterized by highly cohesive ties will tend to reduce the amount of novel information being obtained by the focal actor. Cohesive ties are often associated with the notion of strong ties, which will be described shortly.

Bridging ties, also related to Burt's (1992) structural hole argument, describes the situation where an actor is tied to another actor within the network who has no other links with that network. Bridging ties, are known for the informational and control benefits that they can provide to the actor that acts as the bridge between network actors. Basically, actors that hold a bridging position are more likely to receive novel information relative to the rest of the network as they have a relationship that no one else does (Gulati, et al., 2002). Additionally, actors

holding bridging positions are considered to be in a powerful position as they control access to potentially valuable others.

Network *tie strength* is generally characterized as being either weak or strong. Tie strength involves the relative intensity of the interactions between actors within a network. The intensity of ties is usually indicated by the frequency with which actors interact with one another, the duration of the relationship between partners, or the closeness of the relationship between partners (Granovetter, 1973). *Weak* ties are characterized by relatively low intensity interactions (Granovetter, 1973; 1985). Although the results of empirical work examining weak ties are somewhat mixed, they are generally thought to facilitate the acquisition of new information that is especially relevant in highly dynamic industries and for identifying opportunities. *Strong* ties are characterized by relatively high intensity interactions. Strong ties are seen as useful in stable environments and when firms are concerned with exploitation activities (Granovetter, 1973; March, 1991). Moreover, strong ties are thought to be characterized by trust and the distribution of detailed, and potentially private, information to partners of the strong tie relationship (Gulati, et al., 2002). Researchers tend to utilize different methods for measuring the strength of ties. Some rely on the simple count of interactions between network actors, where relatively stronger ties interact more often than relatively weaker ties. Another method through which strength of ties is accounted for is through classifying the type of network partner. For example, strong ties are considered to compose partners such as kin and close friends (sometimes called personal ties) whereas weak ties are considered to be composed of partners such as non-kin and those with whom the focus of the relationship is economic transactions (sometimes called business ties) (cf., Greve & Salaff, 2003; Hite & Hesterly, 2001; Leung, 2003).

The connectionist perspective. With regard to the much less researched, connectionist perspective, researchers are mainly concerned with the content flowing across network relationships. This line of inquiry is interested in uncovering how actors “can draw on the resources controlled by ... [other actors], including information, money, power, and material aid” [Borgatti & Foster, 2003: 1002]. Thus, although the structuralist perspective investigates the “who” and “how” of network relationships, the connectionist perspective investigates the “what” of network relationships. This perspective has gained recent research interest, particularly within entrepreneurship and for work concerned with knowledge-based perspectives (Conner & Prahalad, 1996). In general, actors that are able to gain the “what” that they need via their network relationships are viewed as successful (Borgatti & Foster, 2003).

Baum, et al., (2000), for example, argue that considering the diversity of a firm’s network of partners is relevant when determining the benefits received from the networks. In their study on the biotechnology industry, they hypothesize and find that *network efficiency* is positively related to a startup’s initial performance. In their study, they define network efficiency as the relative diversity of network partners in terms of information and capabilities present such that there is little redundancy. The underlying argument is that a more parsimoniously diverse group of network partners should provide optimal performance benefits since resources are not wasted on redundant contacts. Moreover, they argue that a more limited, yet comprehensive, set of network partners should reduce the potential for conflicts between partners.

Other work has also examined the content of networks. For example, Borgatti, Jones, & Everett (1998) discuss the diversity of an actor’s network in terms of its *compositional quality*. They define compositional quality as the relative number of network partners that have the types of characteristics that a focal actor needs (e.g., information regarding new technologies, expertise

in certain areas, financial assistant capabilities, etc.). As such, they discuss the notion that networks high in compositional quality will lead to more positive outcomes, such as social capital².

In the present work, I consider *both* structuralist and connectionist perspectives to be important and I focus on how the structuralist and the connectionist perspectives can inform each other. As I will explain, I believe that the content and structure of network relationships will help to determine the relative success of venture development and constructs relative to each perspective will serve as important intervening variables between entrepreneurs and entrepreneurial outcomes. Moreover, I investigate how over time the content of the networks is likely to change during the venture development process due to the structural properties of the network in order to accommodate changing resource requirements, as supported by resource dependence theory. I also assert that there are certain outcomes of venture development that will impact the attainment of new, content and structurally-specific networks.

Structuralist variables included in this work include network size and the strength of network ties. I believe that they, in combination with content characteristics (knowledge), will impact the proposed relationships due to the likely benefits that focal actors can receive from networks with certain structural characteristics. As such, these structural properties act as proxies for content criteria as they provide the structural mechanisms through which required resources are likely to flow. Specifically, I will argue that the relative size of an entrepreneur's network will impact 1) the achievement of venture development outcomes, 2) the nature of subsequent network characteristics, and 3) the subsequent knowledge possessed by the

² In their exposition, Borgatti, et al., (1998) use the term social capital to refer to the perceived value of an actor's social relationships.

entrepreneur. I will further suggest that the strength of entrepreneurs' networks of ties is associated with the subsequent character of the entrepreneurs' networks.

Antecedents to network relationships. The work that has examined the antecedents to, or causes of, networks has been much more limited than that examining consequences, and mechanisms accounting for the consequences, of networks. The work on network antecedents has tended to focus on how and why firms select certain forms of interaction with other firms. For example, this work focuses on explaining how and why firms choose to interact via interlocking directorates, alliances, or some other form of interaction. Explanations some have provided as to the development of networks deal with the physical distance of potential partners and homophily³ issues (Borgatti & Foster, 2003). Others have explained the development of networks and successful maintenance or failure of firm networks as the result of legitimacy issues (Human & Provan, 2000). More recently, some researchers have sought to explain the existence of networks as resulting from the extent of the relationships between network partners (sometimes termed embeddedness) (cf., Hite, 2005; Hite & Hesterly, 2001). It is within this under explored area that some advances have been made investigating the dynamics of networks. These will be discussed next, following the review of the entrepreneurship literature that utilizes a network perspective.

Entrepreneurship Research Studying Networks. The influx of work within the broader organizational sciences that adopted a network perspective sparked interest within entrepreneurship to also integrate network concepts into their work. This work has integrated many aspects of network theory into theoretical perspectives and empirical investigations related

³ Homophily (McPherson, Smith-Lovin, & Cook, 2001) is related to the attraction-similarity hypothesis (cf., Turban & Jones, 1988) that generally asserts that like entities will be attracted to and interact with one another.

to entrepreneurship. Similar to the work discussed above, entrepreneurship researchers have studied the consequences, structural properties, content characteristics, and to a limited extent antecedents and dynamics of networks within the context of entrepreneurship.

The structuralist and connectionist perspectives within entrepreneurship. A bulk of the work integrating network concepts into the entrepreneurship literature has attempted to understand the structural nature and value of different network configurations relative to entrepreneurial outcomes. Specifically, *structural* characteristics of networks that have been extensively investigated include the size of the network (cf., Baum, et al., 2000; Singh, et al., 1997), the strength of network ties (weak versus strong ties) (cf., Brüderl & Preisendörfer, 1998; Granovetter, 1973; Lee, Lee, & Pennings, 2001; Singh, et al., 1997), and the relative location of the focal entrepreneur or firm within the network⁴. With regard to the *content* of the network, researchers have examined the diversity of a focal firm's network partners (also called the compositional quality (Hite & Hesterly, 2001) and/or network efficiency (Baum, et al., 2000) of the network) and more recently, some have investigated the relational mix of network partners in a new venture's network (Lechner & Dowling, 2003; Lechner, Dowling, & Welpe, in press).

The structuralist perspective within entrepreneurship. With regard to network size, research suggests that the larger the size of the network, up to a point, the more information and positive benefits the entrepreneur will gain (Deeds & Hill, 1996; Greve & Salaff, 2003; Singh, et al., 1997). Singh, et al. (1997), for example, studied the relative impact of the size of an entrepreneur's network on the number of opportunities developed. The results from their study indicated a positive relationship between network size and opportunities developed. Cromie and

⁴ In terms of the relative location of the entrepreneur within the network, a number of constructs have been examined, to include those discussed in the more general review presented earlier. For example, entrepreneurship researchers have examined network centrality (Freeman, 1979; Wasserman & Faust, 1994; Gulati, 1999) and the presence of structural holes (Ahuja, 2000; Burt, 1992; Hills, et al., 1997).

Birley (1992) investigated the differences in networking activities between men and women entrepreneurs. In contrast to their hypotheses, the networking activities undertaken by men and women were largely the same. They found that the size of the men and women entrepreneurs' networks did not significantly vary across their samples of interest. Chang (2004), found that the size of a start-up's network was positively related to the start-up's performance. In the context of their study, performance was measured as the venture's time to initial public offering (IPO). More recent work examining network size has sought to integrate other concepts related to size in hopes of providing finer-grained explanations for the influence of size on outcomes. Specifically, Lechner, et al. (in press) examined the relative influence of network size and the relational mix⁵ of entrepreneurs' networks in terms of their impact on performance outcomes. Their results indicated that the relational mix of an entrepreneur's network effectively predicted performance outcomes and they assert that future work should include this construct as opposed to solely using network size.

With regard to the strength of network ties, entrepreneurship scholars have investigated the relative impact of strong versus weak ties on the attainment of entrepreneurial outcomes. Singh, et al. (1997), for example, found that weak ties were associated with the frequency with which entrepreneurs developed opportunities. The reasoning behind this finding is consistent with Granovetter's (1973) strength of weak ties argument whereby weak ties are associated with the acquisition of novel information that can lead to the identification of opportunities. Elfring and Hulsink (2002) argue that strong and weak ties are both important for different purposes

⁵ They define a network's relational mix as "the value-added networks that go beyond exclusively economic relationships" [Lechner, et al., in press: p.2]. The mix that they propose includes: social, reputational, marketing information, co-opetition, and co-operative technology networks. Their basic rationale behind the importance of a network's relational mix is that they expect that firms will use different network linkages at different times to help them develop.

during venture development. They found that entrepreneurs utilize strong ties to obtain crucial resources and weak ties for achieving legitimacy and discovering opportunities. Davidsson and Honig (2003) found that entrepreneurs are more likely to have strong ties with other entrepreneurs (e.g., entrepreneur parents) than non-entrepreneurs and that the presence of weak ties in entrepreneurs' networks was positively related to subsequent performance indicators and venture development activities. The upshot of the work examining the strength of network ties suggests that weak ties facilitate the attainment of informational resources and are helpful in highly dynamic industries and for identifying opportunities. Strong ties are seen as useful in stable environments and when firms are concerned with exploitation activities and gaining access to certain, often more sensitive, resources (Granovetter, 1973; March, 1991).

With regard to the relative location of the entrepreneur within the network, research suggests that more central positions that are composed of tie-bridging relationships are valuable in terms of developing new and potentially valuable network relationships with desirable characteristics (Burt, 1992). With regard to network centrality, research suggests that entrepreneurs that hold more central positions within their network will be able to access and potentially control resources more readily (Hoang & Antoncic, 2003). Soh (2003), for example, suggests that the centrality of entrepreneurial firms within their network positively influences their new product performance. Bygrave (1988) investigates network centrality within the context of venture capital firms. Based on his study, it is asserted that within the context of venture capital firms, links to more central actors are important for information and investment opportunities. In general, entrepreneurship research on network centrality suggests that either being a central actor within a network or being linked to a central actor within a network is beneficial.

With regard to tie-bridging relationships, entrepreneurship researchers often rely on Burt's (1992) arguments to assert that those 1) holding a position between two unconnected others within a network and 2) having a network composed of structural holes⁶ will have better access to resources, especially those related to information. McEvily and Zaheer (1999), for example, illustrate that bridging ties can be a source of competitive capabilities. Moreover, Singh, et al. (1997) suggest that networks characterized by structural holes will be helpful to entrepreneurial opportunity development. In general, work investigating these relationships asserts that bridging ties and networks with structural holes will be a source of information and opportunities.

The connectionist perspective within entrepreneurship. A relatively new area of interest within entrepreneurship investigating networks looks at the content flowing across network partners. Initially, researchers were just interested in the notion that important resources such as information, technologies, or emotional support were individually transferred across network partners. Several studies focused on identifying which types of content (information, technologies, support) were the most advantageous to entrepreneurial outcomes and what structural properties of networks could help transfer these types of resources by individual network partners. These arguments and studies sought to compare the relative importance of different resources transferred on the achievement of entrepreneurial outcomes as well as identifying the relevant network partners from whom these resources were obtained (e.g., kin, former coworkers, etc.). However, newer work has moved beyond examining the benefits from and mechanisms used to get these idiosyncratic contents from specific network partners.

⁶ Structural holes are defined the spatial structure of the network, where dense networks are posited to provide highly redundant information, and structures with gaps, or holes, allow for new information and diverse opportunities to flow throughout the structure (Burt, 1992). Structural holes emphasize the disconnections between an entity's partners (Ahuja, 2000).

Researchers have begun to adjust their inquiries to reflect the benefits and drawbacks of the overall “content composition” of entrepreneurs’ networks.

Those investigating this new notion of content as an important character of entrepreneurs’ networks have looked at similar phenomena in a number of different ways. In general, when these researchers talk about the content of a network they mean the overall composition of the types of resources present in the network, where resources can be tangible (e.g., financial capital) or intangible (e.g., information). The term “diversity” is often used to describe this property of networks. Others have used the term “compositional quality” (Borgatti, et al., 1998; Hite & Hesterly, 2001) to describe the extent to which network ties can provide the resources needed by the entrepreneur. Still others have used terms such as “relational mix” to describe the mix of resources available in networks (Lechner & Dowling, 2001; Lechner, et al., in press).

For example, utilizing a sample of Canadian biotechnology start-ups, Baum, et al. (2000) studied the impact of what they termed “network efficiency” on subsequent start-up performance. In their study, they defined network efficiency as the diversity of information and capabilities per network partner where more efficient networks have comprehensive, yet non-redundant, information and capabilities present in their network. The results of their empirical analyses indicated that, in general, start-ups with more efficient networks experience better performance.

Borgatti, et al. (1998) discuss the concept of compositional quality. They define the compositional quality of an entrepreneur’s network in terms of the number of partners that have high amounts of the required characteristics, or resources (e.g., expertise, power, etc.). That is, the more comprehensive the set of resources provided by a single or a limited number of resource providers, the higher the compositional quality of that network. They relate high levels

of compositional quality to positive entrepreneurial outcomes such as an entrepreneur's social capital. Similarly, Hite and Hesterly (2001) note compositional quality as a potentially important attribute of entrepreneurs' networks, "particularly in the earlier stages of the [new venture's] life cycle" [2001: 284]. Their primary assertion is that the more resources available through each network partner, the more parsimonious and useful a network could become. As such, they propose compositional quality as an important construct for future research investigating implications of networks within entrepreneurship.

Lechner and Dowling (2001) and Lechner, et al. (in press) discuss the role of different "types" of networks on the development of new ventures. These researchers classify network partners into network types corresponding to their value-adding purpose. As such, they identify five network types: social, reputational, marketing, co-opetition, and co-operative technology networks. Social networks include relationships with others characterized by strong ties. Reputational networks include relationships with reputable and established others within relevant markets and in the external environment. Marketing information networks include relationships with those that provide market-related information. Co-opetition networks include relationships with direct competitors. Finally, co-operative technology networks include relationships with others based on some joint technology development. The relative presence of these network types within an entrepreneur's network at any given time composes what they term the "relational mix" of the overall network. In all, they propose and demonstrate that the relative value of these network types will vary over new venture development.

As can be seen above, the argument regarding the content of entrepreneurs' networks is that the more diversity present within the network, the more potential benefits the networks are likely to generate. The overall reasoning behind this assertion is that diverse networks should

provide access to a comprehensive set of needed resources relevant to venture development. As mentioned above, the model that I present in Chapter 2 relies on this notion focusing on the set of knowledge resources present within a founder's network. Specifically, I will rely on the notion that more diverse networks, in terms of the business knowledge relevant to the new venture development, will help entrepreneurs reach developmental outcomes over time. Since the model asserts a temporal and thus dynamic⁷ nature related to the entrepreneurs' networks, I will now review the limited work that has investigated the dynamics of entrepreneurial networks.

Research studying dynamic entrepreneurial networks. An interesting characteristic of the work on networks within entrepreneurship and the broader organizational research is that this work has primarily focused on the static nature of networks. Most of this research has used some form of cross-sectional research design, limiting the inferences that can be derived from the investigations (Gemser, Leenders, & Wijnberg, 1996). Those works that have attempted to understand changes in networks over time, although increasing our understanding of the value of organizational networks, have mostly investigated the impact of networks at one time period on entrepreneurial outcomes at a subsequent time period without consideration as to the changes in the networks themselves (cf. Gemünden, Ritter, & Heydebreck, 1996; Baum, et al., 2000). These works have suggested that network characteristics at one point in time impact the performance of the focal firm. Further, although these papers have taken cross-sectional and more static approaches to understanding networks and entrepreneurship, most recognize the potential for the dynamic role of networks (e.g., Greve & Salaff, 2003; Hite & Hesterly, 2001; Hite, 2005; Larson & Starr, 1993; Lechner & Dowling, 2003; Lee, et al., 2001; Leung, 2003).

⁷ By *dynamic*, I mean changes over time. Throughout this paper, I use terms such as “dynamic”, “change”, and “evolve”. I use these to synonymously mean changes over time.

For example, Greve and Salaff (2003) note, “social networks are not fixed; they are the social context of businesses and can be activated according to different needs (Granovetter, 1985; Burt, 1992)” [2003: 2]. Lee, et al. (2001) call for future work to investigate dynamic relationships that include venture attributes, network relationships, and venture outcomes as variables, as well as for the use of longitudinal data. They further suggest that research should investigate the dynamic impact of networks on venture attributes as well as on the development of future network ties. Hite and Hesterly (2001) recognize the dynamic nature of entrepreneurs’ networks, as evidenced by their proposition that “networks of emerging firms evolve in order to adapt to the firm’s changing resource needs and resource challenges” [2001: 275]. Finally, Lechner and Dowling (2003) and Lechner, et al. (in press) argue that researchers need to pay more attention to how different types of networks change over time in order to enable venture growth. As can be seen, due to the implications of dynamic networks for venture outcomes such as performance and resource attainment, there is an emerging interest in and obvious need for studying dynamic networks within entrepreneurship.

Unfortunately, except for a few research undertakings this work has done little but speculate as to the why, how, when, and with what consequences entrepreneurial networks evolve over time and there is no overarching theoretical or empirical investigation that has sought to more clearly delineate these processes (Isett & Provan, 2005; Gemser, et al., 1996). Additionally, those that have looked at these dynamics have primarily done so theoretically or through qualitative research. Even though these research attempts have been impressive, I seek to build on these and extend them to not only explicate a better developed dynamic model of entrepreneurial networks, but also to conduct a rigorous empirical test of the model. I believe

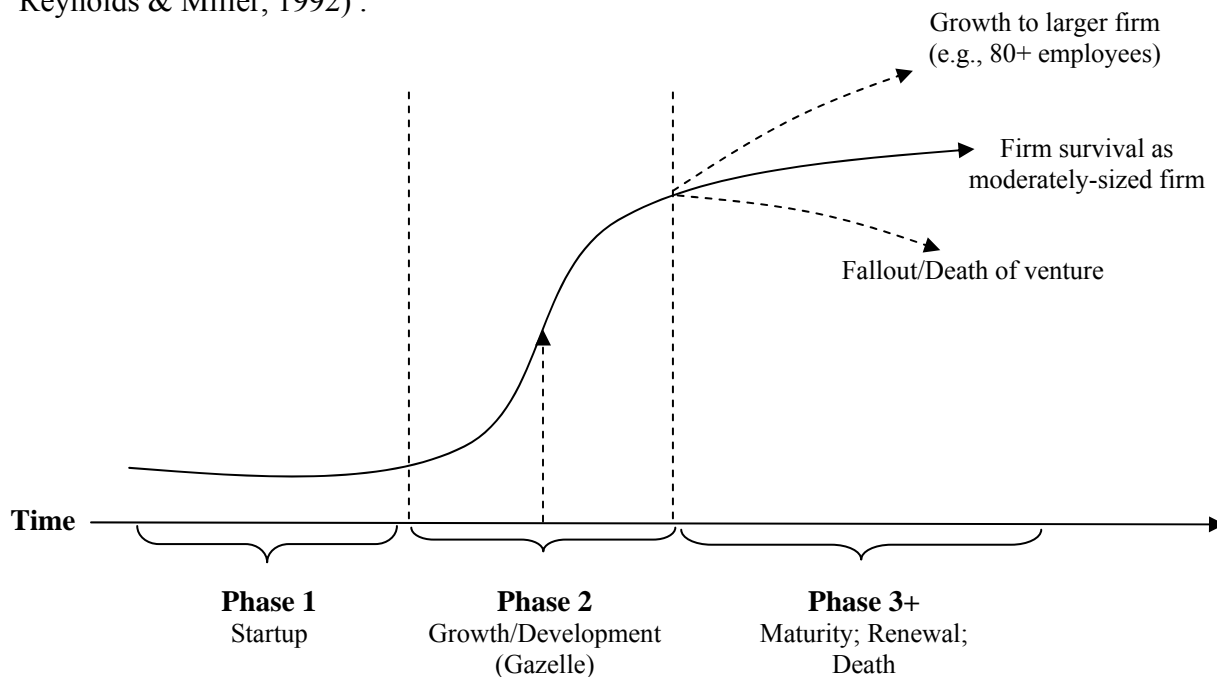
that this contribution will elaborate entrepreneurial network research and will fill an important gap within the entrepreneurship literature.

As mentioned, there is a group of papers that has recently emerged and examined dynamic entrepreneurial networks. These works are particularly relevant to the model I propose as I build upon and extend their work. Before I describe these studies, I must first describe the context within which they position themselves—time.

Work examining dynamic concepts inherently must include the dimension of time. To account for the temporal aspects of dynamic networks, entrepreneurship researchers have tended to contextualize their work within organizational life cycle models (Churchill & Lewis, 1983; Kazanjian & Drazin, 1989; 1990), as roughly exhibited in Chapter 1 Figure 1. Figure 1 illustrates the general organizational life cycle model that has been built within organization theory. Briefly, models using this life cycle model assert that a venture is initially started and, as it successfully develops through the initial start-up phase, the firm will exhibit some pattern of organizational growth. After successfully developing through the growth stage, the firm will either continue growing and become a large firm, plateau and remain a small-to-medium sized firm (SME), or the firm will fail and will cease to exist. In developing this temporal notion within the context of entrepreneurial networks, researchers have attempted to classify the new venture's life cycle into different phases that emerging and early developing firms' experience.

The time periods represented up to the point of inflection in Chapter 1 Figure 1 illustrates the portions of an organization's life cycle that entrepreneurship researchers tend to focus on in their inquiries. As illustrated, entrepreneurship researchers focus on the time periods during which a firm is considered to be in emergence or early development (to the point of inflection in the gazelle stage from Chapter 1 Figure 1). Since entrepreneurship research looks at early stage

ventures, a main concern has been how to identify appropriate samples to examine phenomena in these stages. Thus, much work examining network dynamics within entrepreneurship has sought to 1) more finely distinguish the boundaries of organizational establishment – sometimes called stages, or phases of venture development, and 2) examine ventures prior to birth⁸ (also called firm emergence) (Hansen & Bird, 1997; Katz & Gartner, 1988; Kazanjian & Drazin, 1989; 1990; Reynolds & Miller, 1992).



Chapter 1 Figure 1 Traditional Organizational Life Cycle Model

Thus, to position their work within time, those examining dynamic entrepreneurial networks, have utilized some classifying scheme that developed out of general organizational life cycle models whereby they have identified the relative stages of new venture development.

⁸ Although there has been some debate as to when firm birth is thought to have occurred, based on my literature review the general consensus is that a “new firm is an active participant in the economy” [Reynolds & Miller, 1992: 405]. As such, some major firm event (often called a marker) such as first sale or hire date of first full-time employee must have occurred (Gartner, Shaver, Carter, & Reynolds, 2004; Hansen & Bird, 1997). Prior to firm birth, as indicated by a marker event, the firm is considered to be in the emergence or gestation stage. I use the term “emergence” to indicate this time period prior to firm birth. After firm birth, I refer to the venture as being in the “early growth” phase.

Although more clearly delineating the character of these stages is not the focus of my work, I *do* rely on the notion that there are distinct indicators of the stages/phases of new venture development, so this work *is* relevant. I will not review the literature on this work here, but a review is presented in Appendix A. Suffice to say, that research has delineated specific markers, or outcomes, that are used as indicators for different stages of emerging ventures. These markers have been used in previous work on dynamic networks, and I will use them in my model. I now discuss the research examining dynamic entrepreneurial networks. An overview of these studies is presented in Chapter 1 Table 1.

Chapter 1 Table 1 Studies Examining Dynamic Entrepreneurial Networks

Reference	Key concepts	Key variables	Key predictions and findings	Key contribution	Sample and method (if applicable)
Larson and Starr (1993)	The transformation of entrepreneurs' networks into organizational networks	<ul style="list-style-type: none"> • Dyadic networks • Transforming dyads to socioeconomic exchanges • Selectively finding, screening, and selecting additional networks • Start-up success 	Entrepreneurs' networks will transition from simple dyads to more complex network relationships. The relative success of these transitions will aid in start-up success. Existing ties can help generate future ties.	First article to recognize entrepreneurs' networks as undergoing dynamic transformation processes	N/A (theoretical paper)
Johannisson (1996)	Nascent entrepreneur's personal and business networks will change over time	<ul style="list-style-type: none"> • Personal networks • Business networks • Transforming dyads to socioeconomic exchanges and vice versa 	Predicted and found that 1) network relationships would change to become more multiplex in nature and 2) that multiplex relations lasted longer than single-faceted relations.	Nascent entrepreneurs' networks will be dynamic and will become multiplex (both personal and business in nature) in order to keep the business on a personal level.	<ul style="list-style-type: none"> • Panel-study of Swedish nascent entrepreneurs • Survey design • Frequency analysis
Greve and Salaff (2003)	Entrepreneurs' networking activities will vary across three initial phases of venture development	<ul style="list-style-type: none"> • Network size • Time developing networks • Time maintaining networks • Presence of kin in networks • Country differences in networking • Phases of venture development • Kin vs. non-kin in network 	Entrepreneurs' networks size and time spent networking, and the importance of kin in networks will vary. They found more time was spent networking during venture emergence, kin was important across phases, women used kin more than men, patterns consistent across countries (except network size and time spent networking)	Entrepreneurs' networks are dynamic across phases of venture development, at least in terms of size. Further, networking activities (time spent developing and maintaining) networks will vary over time. Supported their general assertions across an international sample.	<ul style="list-style-type: none"> • Cross-sectional surveys, retrospective recall • Nascent entrepreneur samples from USA, Italy, Norway, and Sweden • Egocentered network analysis • OLS regression and ANOVA

Reference	Key concepts	Key variables	Key predictions and findings	Key contribution	Sample and method (if applicable)
Hite and Hesterly (2001)	Networks of emerging firms change due to changes in resource requirements	<ul style="list-style-type: none"> • Network embeddedness • Cohesive ties • Structural holes • Path-dependent network • Intentionally-managed network • Firm success • Stages of venture development • Social Ties • Calculative Ties 	Develop a dynamic model of new venture network embeddedness. During emergence, entrepreneurs' networks will consist of social, cohesive ties. During early growth, network composition will change to be more calculative in nature and the presence of structural holes will increase. In early growth, firms will be able to manage their networks versus being path-dependent on current networks during emergence.	The development of an evolutionary model of new ventures based on changing resource needs over time and the level of network tie embeddedness	N/A (theoretical paper)
Lechner and Dowling (2003)	Explore how ventures grow and compete by using different network relations. Further, the relational mix of the network will change over time to facilitate growth and competitiveness.	<ul style="list-style-type: none"> • Phases of venture development • Strength of ties • New venture growth • Relational mix 	Study the relational mix of network partners for growth-oriented ventures, how that mix changes over time, and what role weak and strong ties play, all to enable growth. They find that the value of different network types changes over time and that both strong and weak ties are important enablers of firm growth.	Different issues such as the relational mix and the strength of network ties, coupled with network management practices of network building, maintaining, and restructuring are important factors for determining growth during different phases of venture development.	<ul style="list-style-type: none"> • Qualitative, case study methods • Sample of entrepreneurial, growth-oriented, IT firms • Examined egocentric networks

Reference	Key concepts	Key variables	Key predictions and findings	Key contribution	Sample and method (if applicable)
Leung (2003)	The evolution of entrepreneurial firms' social networks is important to different developmental stages of the firm in terms of HRM needs.	<ul style="list-style-type: none"> • Stages of venture development • Strength of ties • Directness of ties • Human resource requirements over developmental phases • Personal networks • Business networks 	Propose that entrepreneurs must consider fit factors over different stages of venture development in terms of securing the most appropriate human resources. They found that during start-up, entrepreneurs rely on their personal network (strong ties) in recruiting core team members. During growth, the business network becomes the primary source for searching for key talent.	Examined dynamic networks within an HRM context and suggests that key HR talent is acquired through different network partners during different phases of venture development.	<ul style="list-style-type: none"> • Qualitative, case study methods • Sample consisted of early stage, growth-oriented, entrepreneurial firms
Hite (2005)	The extent of relational embeddedness of network partners will vary over time. Specific components of social relationships help facilitate evolution to full relational embeddedness and there are different evolutionary paths that can lead to full embeddedness.	<ul style="list-style-type: none"> • Relationally embedded network ties • Evolutionary paths to fully embedded ties • Network entry • Social component leverage • Trust 	Proposes methods through which network ties of emerging firms can evolve toward increased relational embeddedness and uses components of individual action to explain evolution. Found that processes (network entry, social leverage, and trust) and paths, as facilitated by personal, dyadic, and social factors influence the relative relational embeddedness of network partners.	Qualitatively tests a dynamic model of network relational embeddedness and identifies processes and paths that lead to network embeddedness within a sample of emerging entrepreneurial firms.	<ul style="list-style-type: none"> • Qualitative, case study methods • Sample consisted of founders' networks within emerging firms

Reference	Key concepts	Key variables	Key predictions and findings	Key contribution	Sample and method (if applicable)
Lechner, Dowling, & Welpel (in press)	Investigates the robustness of utilizing network relational mix versus network size to explain network development in early-stage ventures.	<ul style="list-style-type: none"> • Relational mix of network (social, co-opetition, marketing, and cooperative technology networks) • Network size 	During venture development, different network types will be valuable. Relational mix is a more robust construct for studying network development and firm performance implications versus network size. They found different network types were associated with different performance indicators and relational mix is a more robust indicator of networks and firm performance.	Ventures have different types of networks that are important to different venture development tasks and that are thought to vary over developmental phases. Network relational mix is a more appropriate construct for explaining network development as opposed to network size.	<ul style="list-style-type: none"> • Cross-sectional surveys, retrospective recall • Samples of early-stage European, venture capital-financed firms

In one of the first, theoretical, investigations of dynamic networks, Larson and Starr (1993), in building from the work of Starr and MacMillan (1990) developed a network model of organizational formation. Their model “fundamentally...describes the transformation of exchange relationships from a set of relatively simple, often single-dimensional dyadic exchanges into a dense set—a network—of multidimensional and multilayered organizational relationships.” [Larson & Starr, 1993: 6]. In doing so, these researchers classified the transformations of the network in terms of three stages of development: 1) stage 1, pre-organization, focusing on the essential dyads, 2) stage 2, organizational formation, converting dyadic ties to socio-economic exchanges, and 3) stage 3, full organization, layering of exchanges. These researchers describe the process of building a network by including processes of exploration, screening, and selection to determine the usefulness of network dyads over venture emergence. They further describe the potential for existing ties to help in the establishment of future ties that could help the start-up (Witt, 2004). Overall, Larson and Starr’s model describes how an entrepreneur’s personal networks can be dynamically transformed into an organizational network for the new venture, and it was the first of its kind (Witt, 2004).

Johannisson (1996) studied the dynamics of entrepreneurial networks utilizing a panel study of Swedish entrepreneurs. In the study, Johannisson assessed the networks of the sample of entrepreneurs at the beginning and end of a 6-year time period. Similar to Larson and Starr (1993), Johannisson argues that entrepreneurs’ networks are dynamic in that business relationships tend to transition toward personal relationships and that some personal relationships take on a business orientation. In these instances, it is proposed that these relationships will

become multiplex⁹ in order to keep the business operations on a personal level and thus more easily managed. In testing these dynamics with the panel data, results suggested that entrepreneurs report that their most important ties in their personal network are equally socially and business oriented. Further, ties that were initially business oriented that take on a more personal character over time lasted longer than when they did not become multiplex. Overall, the results of this study support the dynamics reported by Larson and Starr (1993).

Other work more directly suggests that due to the different resource requirements that firms face as they emerge and grow, we should expect that entrepreneurs' networks will change over time. Hite and Hesterly (2001), for example, theoretically examined how "networks of emerging firms evolve in order to adapt to the firm's changing resource needs and resource challenges" [2001: 275]. The underlying premise of their model was that the nature of network evolution will change over firm emergence and early growth to exhibit differential levels of embeddedness¹⁰, cohesiveness, and structurally bridging ties. Additionally, the processes¹¹ through which these changes occur are thought to vary over phases of development. Specifically, they propose that during firm emergence, entrepreneurs will be path-dependent on the cohesive, social ties that they have. They propose that as the venture develops into early growth, entrepreneurs' networks will evolve to contain more calculative ties (those based on economic transactions) and there will be an increased presence of structural holes. They further theorize that in subsequent phases of development the networks will contain a balance between

⁹ Multiplex refers to a network partner that holds more than one position in an actor's overall network. For example, a family member (who is an obvious social, or personal, contact) could become involved in the venture, thus taking on an additional role in the business network.

¹⁰ Degrees of social embeddedness vary in terms of the level of economically-oriented control mechanisms used to govern the commercial transactions that occur via social relations and networks (Uzzi, 1997). Socially embedded ties do not use economically-oriented control mechanisms and instead rely on rules of social exchange like trust and reputation to govern the transactions.

¹¹ They proposed that networks will follow more path-dependent processes during emergence and networks will be more intentionally-managed during early growth.

social and calculative ties, entrepreneurs will exploit the benefits of structural holes, and entrepreneurs will be more equipped to intentionally manage their network as opposed to being path-dependent upon current ties.

Hite (2005), in further elaborating Hite and Hesterly's (2001) work, qualitatively examined changes in the relational embeddedness of entrepreneurs' networks. Relational embeddedness is proposed as an important characteristic of networks as the extent of embeddedness is associated with important entrepreneurial outcomes like opportunity discovery, resource attainment, and governance issues. Hite (2005) found that as entrepreneurs' networks evolve during venture emergence and early growth, the character of their networks will tend to follow different processes and paths as they develop toward full embeddedness. Her case studies revealed seemingly consistent patterns of evolution toward embeddedness. Specifically, Hite suggests three evolutionary processes that impact network evolution toward full embeddedness: network entry, social component leverage, and trust facilitation. Further, the evolutionary processes are proposed as being impacted by attributes of social components. Social components essentially entail the types of interactions used and reasons for interacting with the network partners. The three social components discussed are social capital, personal relationships, and dyadic interactions, and each has a number of attributes associated with it. The qualitative analyses revealed four paths through which networks evolve toward embeddedness. Overall, the entrepreneurs' network partners in Hite's (2005) study evolved from low levels of embeddedness to full embeddedness through one of four paths and through some combination of three evolutionary processes.

Leung (2003), within a human resource context, examined the start-up and growth phases of a venture's development in order to qualitatively examine the evolution of entrepreneurial

firms' social network ties across these different developmental stages of the firm. Leung's case studies supported the work of Hite and Hesterly (2001), suggesting that,

“...organizations at different phases of development face different constraints as well as different network strategies adapted by entrepreneurs in acquiring their resources. At the start-up phase, entrepreneurs rely mainly on their personal social network in recruiting their core team members. During the growth phase, the firm's business networks become the primary source for searching for key talent.” [2003: 316].

Leung proposes that the usefulness of entrepreneurs' networks should be conceptualized beyond the attainment of traditional resources, and future work should 1) consider networks as helpful in acquiring human resources, 2) recognize the different human resource needs over venture development, and 3) study how changes in networks over time can help facilitate the recruitment of key talent over different phases of development.

Greve and Salaff (2003) investigate dynamic entrepreneurial networks in terms of the size of networks and time spent on different networking activities during different phases of venture development. Specifically, they examine the relative size of entrepreneurs' networks and the time they spend on developing and maintaining different network ties over time. They further examine the composition of the networks (e.g., those containing family members) over venture development. The premises were that over time, the relative importance of developing new ties and maintaining current ties would vary. The phases of interest in their study, which included samples from four nations, were phases they called motivation, planning, and establishment or taking over a firm¹². The motivation and planning phases are consistent with what I call firm emergence because they include those activities prior to firm birth. The

¹² They make the distinction between an entrepreneur either creating an entirely new entity or taking over an existing firm. Regardless of which method is used to begin the venture, these phases are characteristic of early venture development/growth. They conceptualize the motivation and planning stages as the same, consistent with emergence, regardless of which route entrepreneurs' choose for “birthing” their venture.

establishment or taking over a firm phase involves the early development phase. Overall, their results suggest that “entrepreneurs build networks that systematically vary by the phase of entrepreneurship ...” [2003: 1]. Specifically, they found that entrepreneurs’ networks are largest in the planning phase, as is the time spent developing and maintaining network; kin are equally important across all phases; women entrepreneurs rely on kin more than men; networking activities tend to be consistent across novice and experienced entrepreneurs; and networking patterns were consistent across all countries with the exception of network size and time spent networking.

Lechner and Dowling (2003), through case-study analyses, examined the varying issues relevant and practices used to manage network building, maintenance, and restructuring during different phases of firms’ development. They studied social, reputational, co-opetition, knowledge and innovative, and marketing networks (these were defined above). Results suggest that the relative value of social and reputation networks decreases as ventures develop, and co-opetition networks increase during development. Moreover, the ability of ventures to form knowledge and innovation networks was a function of reputation and management capacity, and for marketing networks, the venture’s culture and the management style used was important. Finally, they suggest that weak ties and strong ties are both important for growth because of the different needs that they fulfill. Overall, they found that the value of different network relationships varied over phases of development and that the ability of firms to obtain certain kinds of resources (e.g., knowledge and innovative capabilities) was a function of network management practices. Additionally, both strong and weak ties were important over different phases of development as their presence tends to serve different resource acquisition purposes.

Finally, in building on the work of Lechner and Dowling (2003), Lechner, et al. (in press) studied the relative value of different network types on the performance of early-stage ventures. Using a cross-sectional, retrospective recall, design with a sample of European venture capital-financed firms, they explored 1) if the relational mix of a network was a more appropriate indicator of network development and firm performance when compared to network size, and 2) the value of different network types within a relational mix of network partners, relative to performance outcomes. The types of networks that they examined within a relational mix included: social, reputational, marketing, co-opetition, and co-operative technology networks. They developed a number of hypotheses related to the expected value of network size and each network type on different performance outcomes and relative to different stages of venture development. Their results suggested that relational mix was a more appropriate construct for assessing network development and that it more precisely predicted performance outcomes when compared to network size. They reported positive relationships between reputational and cooperative technology networks at venture founding and subsequent venture performance (time-to-break-even). Social networks at founding were not related to time-to-break-even and were negatively related to sales after the founding stage. Finally, they concluded that marketing and co-opetition networks were important to firm performance (sales) after the founding stage.

The above review of the work studying dynamic entrepreneurial networks, coupled with an examination of Chapter 1 Table 1, points to some overarching consistencies that have emerged across these works. First, work in this area consistently positions the temporal aspect of network dynamics within different phases (also called stages) of venture development. Second, the commonly studied focal phases of development are firm emergence and early growth. Third, work in this area has been largely theoretical in nature. Fourth, studies examining the network

dynamics have been mostly qualitative in nature. Fifth, those works empirically examining these phenomena have used cross-sectional research designs and have utilized retrospective recall methods. Sixth, most of these works support the further investigation of and assert the need for a dynamic network model that is supported by longitudinal empirical tests of the model's assertions. Seventh, each of these studies has integrated some aspect of network content as important for network evolution (e.g., relational mix, dyadic vs. socioeconomic ties, kin vs. non-kin partners, social vs. calculative—economic—ties, personal vs. business networks) in order to account for the management of resources via networks relevant to the venture over time. Finally, although these works have recognized the potential for interactive relationships to impact entrepreneurial networks and their dynamics, these works have focused on main effects or qualitatively emerging relationships rather than looking at potential contingencies impacting the relationships.

The consistencies noted above suggest basic properties that should be included in studies of dynamic entrepreneurial networks. Additionally, the review of the literature suggests important areas where future work can contribute. The model of dynamic entrepreneurial networks, to be discussed in the next chapter, integrates these properties and builds on this prior work.

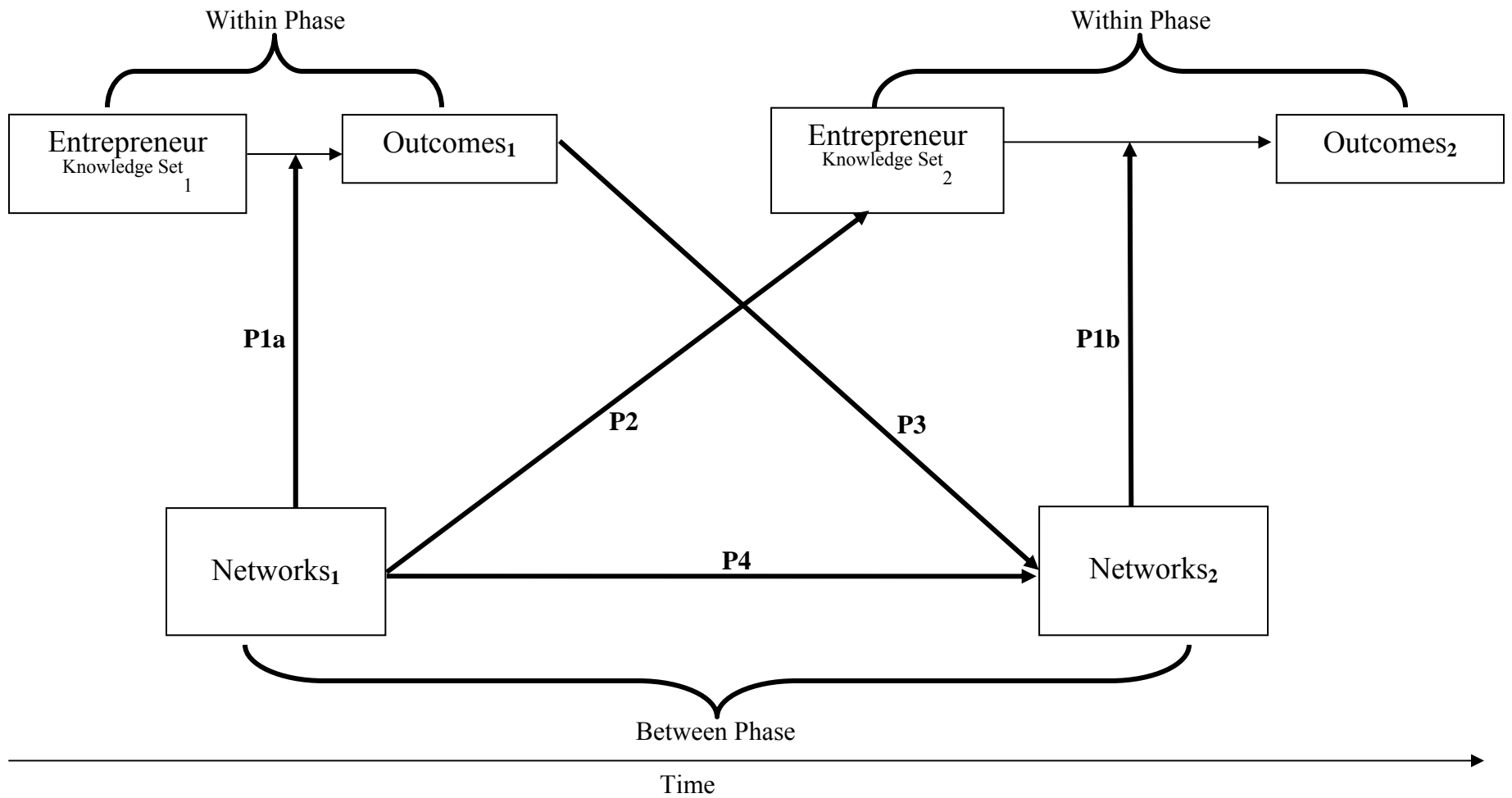
CHAPTER TWO: MODEL OF DYNAMIC ENTREPRENEURIAL NETWORKS

In chapter one, I have reviewed the literature relevant to my model of dynamic entrepreneurial networks. I will now turn attention to explaining my model of dynamic entrepreneurial networks that is presented in Chapter 2 Figure 1. I will begin by positioning the model within time by defining the phases of venture development to which the model is intended to apply. I will then present a boundary condition of the model, being sure to clearly explicate the level of analysis at which I discuss the networks. Then, I will define the variables in the model. Finally, I will describe the expected relationships, being sure to provide a theoretical rationale for why they should be expected. Propositions and testable hypotheses corresponding to the model are developed along the way.

Phases of Interest

The model in Chapter 2 Figure 1 illustrates the relationships between entrepreneurs' networks, entrepreneurs' knowledge sets, and new venture development outcomes that I expect to occur over the first two phases of new venture development—emergence and early growth. To be clear, I define venture emergence as the phase of venture development prior to firm birth, where firm birth is considered to occur at the point when a major firm economic event occurs (e.g., first sale or first full-time employee hire). I further define early growth as the period of new venture development that commences following firm birth. More details as to the character of the phases will be described in the definition section. These notions are consistent with prior work on the properties of emerging organizations (Hansen & Bird, 1997; Hansen, 1991;

Reynolds & Miller, 1992) and with the definition of a new firm as being “an active participant in the economy” [Reynolds & Miller, 1992: 405].



Chapter 2 Figure 1 Dynamic Model of Entrepreneurs and Their Networks

As I discuss in Appendix A, I have selected these phases of development for several theoretical and practical reasons. Theoretically, I believe that during early stages of venture creation, the character of entrepreneurs' networks will be particularly likely to exhibit a dynamic and evolutionary nature. This notion is consistent with previous work that notes that young firms are most likely to be impacted by external relationships (Eisenhardt & Schoonhoven, 1996; Yli-Renko, Autio, & Sapienza, 2001). Further, the impact of these changes relative to entrepreneurs is likely to be greater in earlier periods of venture development since the entrepreneur is so intimately involved with the development of the firm during these early stages (Kazanjian & Drazin, 1990; Larson & Starr, 1993). It is also likely that studying a better organized or more developed venture, having already successfully evolved through the phases of interest here, would leave a lack of understanding as to how the firm developed to the more organized state.

Additional reasons that I focus on emergence and early growth include that the focal periods of organizational development, those in which entrepreneurship researchers are interested, include those corresponding to new venture creation and early development and this is consistent with emergence and early growth. Moreover, studying network development over emergence and early growth is consistent with the current work in the area and specifically that dealing with dynamic entrepreneurial networks (cf., Greve & Salaff, 2003; Leung, 2003). Thus, this should allow me to appropriately position my work within the current literature. This is also consistent with the definition of entrepreneurship that I adopt, as "... activity that involves the discovery, evaluation and exploitation of [entrepreneurial] opportunities" (Shane, 2000: 4). Finally, it is believed that resources acquired early in a venture's development will be important to firm development, long beyond initial development stages (Baum, et al., 2000) so studying them in early phases is important.

In terms of the practical reasons for focusing on these early stages of development, acquiring longitudinal data is expensive and timely. The longitudinal, empirical, data that are available to test some of the model's assertions (as discussed in Study One, Chapter 3) focuses on the early stages of venture development¹³ and includes early-stage data about the founding entrepreneur, as opposed to later-stage data.

Overall, the model illustrates relationships that occur across these two phases of development. As such, there are relationships proposed to occur within the phases as well as relationships that are proposed across, or between, phases. The distinction between the phases is indicated in the model through coding the phases via the use of subscripts. Variables that indicate a subscript number 1 are intended to correspond to the venture *emergence* phase of development. Variables indicating a subscript 2 are intended to correspond to the subsequent *early growth* phase. This notion brings to light an additional issue that must be clarified. Although this idea will be very clearly explained when I define the variables below, it should be noted that since this is a dynamic model, the variables are different during each phase. Specifically, the outcomes₁ (firm emergence) are different outcomes than those for outcomes₂ (early growth). This is because during new venture development, relevant benchmarks indicative of successful venture evolution should change.

Boundary Conditions

A boundary condition of my work is that I limit my theorizing to include only the characteristics and networks of a single entrepreneur, the founder, of the venture. As mentioned

¹³ As will be discussed later in the description of Study One in Chapter 3 the nature of the data focuses on new ventures from emergence through 3-4 years of development. Further, as funding permits, these data are a part of an ongoing data collection project being undertaken by the University of Michigan and the Panel Study of Entrepreneurial Dynamics (PSED), sponsored by the Ewing Marion Kauffman Foundation. Additionally, as will be described in Study Two, the present research effort seeks to set up an ongoing data collection procedure that will allow for more well developed ventures to be assessed in my future work.

above, even though I recognize that new ventures can be founded by more than one individual, as in the case of a founding team, I restrict my theoretical developments and proposed operationalizations to include only a single, individual, entrepreneur. In cases where there is a founding team, I define the entrepreneur as the individual with majority ownership (Hite, 2005). Thus, when I discuss the states of the entrepreneur, I intend this to apply to the relevant states of the individual entrepreneur based on the above classification. When I discuss the entrepreneurs' networks, I intend this to apply to the egocentric network of the entrepreneur—individual-level network. This is consistent with the literature, as research suggests that the entrepreneur remains as the central actor to all decision-making and venture-related activity in the phases of interest that I discuss (Kazanjian & Drazin, 1992). It should be noted that although I have made this distinction for expositional and methodological simplicity, it is easy to imagine that the relationships that I discuss could apply to groups beyond single entrepreneurs. Regardless, a discussion of my model that includes implications for a founding team or other organizational members is reserved for future research.

Definitions

I will now turn attention to defining the variables presented in my model of dynamic entrepreneurial networks. Where relevant, I will clearly discuss how the variables are different across the phases. First, I will define what is meant by the states of entrepreneurs' knowledge sets. Then I will move on to discuss the variables included for the entrepreneurs' networks. Finally, I will discuss the outcomes of interest for my model.

Entrepreneurs and their sets of knowledge. Before defining what I mean by the state of *entrepreneurs' knowledge sets*, I must first more clearly discuss what is intended when I talk about an entrepreneur. I define the *entrepreneur* as the individual, or founder, of a new business

venture that had not previously existed (Shane, 2000). Thus, when examining the impact of entrepreneurs' knowledge sets within the model, I include only the knowledge sets of the single entrepreneur as relevant to this model. Again, I do not preclude the notion that others involved in the venture (as in the case of a founding team) might not impact these relationships at a different level of analysis (e.g., venture team-level networks), but they are not included in this paper. Further, my model is only intended to apply to *nascent* entrepreneurs and not intrapreneurs or other individuals within an existing entrepreneurial firm. I define a nascent entrepreneur as an individual who "initiates serious activities that are intended to culminate in a viable business start-up (Reynolds, 1994)" [Aldrich & Martinez, 2001: 43].

Additionally important to my construct named, "entrepreneurs' knowledge sets" is a definition of *knowledge*. I develop my definition of knowledge by drawing on the work in entrepreneurship that has examined individual entrepreneur characteristics relevant to venture development (cf., Alvarez & Busenitz, 2001; Fiet, 1996; Hills, Shrader, & Lumpkin, 1999; Ronstadt, 1988; Shane & Venkataraman, 2000; Shane, 2000; Shook, Priem, & McGee, 2003) as well as from the knowledge-based perspective (Conner & Prahalad, 1996; Kogut & Zander, 1992; Morgan, Zou, Vorhies, & Katsikeas, 2003; Spender, 1996).

Individual entrepreneurs' characteristics impact on entrepreneurial outcomes has been explored quite extensively. Although much of this work has examined psychological traits, the overall consensus is that this work is unreliable and inconclusive (Shook, et al., 2003). A more promising characteristic that researchers have examined relative to entrepreneurial outcomes relates to the information, knowledge, and prior experience of the entrepreneur (Fiet, 1996; Hargadon & Sutton, 1997; Hills, et al., 1999; Shane, 2003; Shook, et al., 2003). The argument is that entrepreneurs, as a result of their past experiences and their accumulated information and

knowledge stocks, will better (or worse, or differently) be able to achieve certain entrepreneurial outcomes relative to others possessing different experiences and information and knowledge stocks (Ronstadt, 1988; Shane, 2000). Thus, a unique knowledge-related characteristic of entrepreneurs is related to their prior experience.

Knowledge-based perspectives (KBV) grew from the resource-based view (RBV). The underlying argument of the RBV is that firms are bundles of resources and that the ability to accumulate rare, non-substitutable, valuable and inimitable resources can be the source of a competitive advantage (Penrose, 1959; Barney, 1991). The KBV is considered an outgrowth of the RBV “to the extent that it focuses upon knowledge as the most strategically important of the firm’s resources” [Grant, 1996: 110]. Further, KBV posits “that privately held knowledge is a basic source of advantage in competition” [Conner & Prahalad, 1996: 477]. The argument in applying KBV to new venture development is that the possession of idiosyncratic knowledge relevant, in any way, to the venture development and competitive process should be advantageous and a source of competitive advantage. Work advancing this notion in strategy and entrepreneurship has sought to identify different types of knowledge relevant to organizations and link them to relevant outcomes (cf., Agarwal, Echambadi, Franco, & Sarkar, 2004; Dew, Velamuri, & Venkataraman, 2004; Itami & Roehl, 1987; Morgan, et al., 2003; Shane, 2000; 2003; Wiklund & Shepherd, 2003; Zahra, Nielsen, & Bogner, 1999). The upshot of this work is that more well-rounded knowledge regarding business-related factors¹⁴ is advantageous (Morgan, et al., 2003).

¹⁴ Although work in this area has examined many types of business-related knowledge, a bulk of work examines technological and market-related knowledge (Agarwal, et al., 2004; Morgan, et al., 2003; Wiklund & Shepherd, 2003).

Utilizing these two perspectives that discuss the relevance of knowledge to entrepreneurs and the venture development process, I define an *entrepreneurs' knowledge set* as the comprehensive set of business-related knowledge possessed by the entrepreneur at one point in time. This includes knowledge related to the venture development process like finance, market-related, management, and technological¹⁵ knowledge, etc. This definition is appropriate as it 1) recognizes the notion of prior experience of the entrepreneurs, and 2) composes business-related resources relevant to venture creation.

I should also note that the knowledge set is the “state” of the comprehensiveness of entrepreneurs' knowledge at any given period in time. That is, entrepreneurs' knowledge sets are only static relative to each developmental phase. As a result of accumulating interactions, experiences, and other factors involved with the development process, each subsequent phase should lead the entrepreneur to possess a different state, or set, of knowledge.

Entrepreneurs' network characteristics. I include both content and structural facets of networks in my model. Following the connectionist perspective, to account explicitly for the content characteristics of entrepreneurs' networks, I study the composition of the knowledge present in the networks with the variable, *network knowledge heterogeneity*¹⁶. Consistent with the RBV and KBV, the network knowledge heterogeneity is defined as the diversity of the knowledge resources present in the network. To account for network structure factors, I study the size of the entrepreneurs' network and the strength of the ties to network partners. I now define each variable.

¹⁵ I use the term *technological* in a broad sense to include all aspects of the ventures' offerings, including the tangible aspects as well as the processes and know-how involved with the offerings' creation.

¹⁶ Throughout this dissertation, when referring to the variable of network knowledge heterogeneity, I will use the terms network knowledge heterogeneity and network knowledge sets synonymously. For expositional simplicity, proper grammar, and effective expositional style, the term network knowledge sets was sometimes more appropriate.

Network knowledge heterogeneity. Network knowledge heterogeneity is defined similarly to entrepreneurs' knowledge sets. The KBV asserts that knowledge is an important resource and that privately held knowledge (knowledge shortcomings) is a source of competitive advantage (Dew, et al., 2004). Thus, entrepreneurs who are able to lessen their knowledge shortcomings about factors relevant to venture creation should be in a more competitive position. As such, similar to my definition of entrepreneurs' knowledge sets, I define the entrepreneurs' *network knowledge heterogeneity* as the comprehensive set of business-related knowledge possessed by the entrepreneurs' network partners. Also like the entrepreneurs' knowledge sets, this includes knowledge related to the venture development process like finance, market-related, management, and technological¹⁷ knowledge, etc. The knowledge in entrepreneurs' networks is considered knowledge resources because the knowledge in the network is external to the entrepreneur—in the external environment—and so knowledge obtained from the network is essentially an external *resource* provided to the entrepreneur. This is also consistent with the RBV and KBV that view knowledge received from the external environment as a resource.

Network size. Following others, the *size* of the entrepreneur's network is simply defined as the total number of first-order (direct) actors with whom the entrepreneur interacts (cf., Greve & Salaff, 2003).

Strength of network ties. The *strength of network ties* is defined as the intensity of the interactions between the entrepreneur and the network partners. Thus, *strong ties* are characterized by high intensity and frequent interactions. *Weak ties* are characterized by low intensity and infrequent interactions (Granovetter, 1973; 1985).

¹⁷ I, again, use the term *technological* in a broad sense to include all aspects of the ventures' offerings, including the tangible aspects as well as the processes and know-how involved with the offerings' creation.

Outcomes. As briefly mentioned above, the outcomes relevant to my model vary by phase. As such, the entrepreneurial outcomes relevant to phase 1, which correspond to the emergence phase of venture development, are expected to be different from those in phase 2, the early growth phase. The rationale for why this should be expected was reviewed in Appendix A. Additionally, the character of entrepreneurs' knowledge sets and their networks is thought to vary by phase of venture development. These outcomes are now defined.

Phase 1 outcomes (emergence phase). Following the thinking of work that has identified properties of emerging organizations I define the outcomes in my model as those corresponding to the boundary properties of successfully emerging organizations (Hansen, 1991; Hansen & Bird, 1997; Katz & Gartner, 1988; Kazanjian & Drazin, 1989; 1990; Reynolds & Miller, 1992). Since I have previously defined the emergence phase of new venture development as including those facets of venture creation prior to firm birth, I define the boundary of the emergence phase as a marker of venture birth. Following previous work (Hansen & Bird, 1997; Reynolds & Miller, 1992), outcomes relevant to the emergence phase include 1) the *date first sale of a commercial product or service* and/or 2) *date of hiring the first full-time employee* (beyond the founder). I include both as markers of venture birth as there has been some debate as to which more appropriately indicates the end of the emergence stage (Hansen & Bird, 1997; Reynolds & Miller, 1992). Moreover, these markers are consistent with the definition of a new firm as "an active participant in the economy" [Reynolds & Miller, 1992: 405]. Specifically, they will be included as outcomes as 1) the number of days from founder commitment to the pursuit of the venture to the first commercial sale of a product or service, and 2) the number of days from founder commitment to the first full-time employee hire. Following the work that has sought to define organizational boundaries (Hansen, 1991; Hansen & Bird, 1997; Katz & Gartner, 1988;

Kazanjian & Drazin, 1989; 1990; Reynolds & Miller, 1992), commitment is defined as when entrepreneurs engage in an act "... toward achieving the goal of creating a new organization" [Katz & Gartner, 1988: 431]. Acts that have been discussed as corresponding to this time marker include the entrepreneur purposefully seeking information useful for starting a new organization and more concrete markers like filing a tax number application (Katz & Gartner, 1988).

Phase 2 outcomes (early growth phase). Following other work that has utilized phase markers as indicators of venture development, and consistent with the outcomes used in the emergence stage (Hansen & Bird, 1997), the outcomes of interest in the early growth stage include sales and the venture size (in terms of the total number of full-time employees). Specifically, I consider two outcomes in phase 2: *first year sales* (the dollar amount of sales in the twelfth month following commitment to pursuing the venture), and *first year venture size* (the number of full-time employees in the twelfth month following commitment to pursuing the venture). Assessing these outcomes one year following a significant marker event as an indicator of early growth is consistent with previous work (Hansen & Bird, 1997; Gartner, Shaver, Carter, & Reynolds, 2004).

Entrepreneurs' knowledge sets as outcomes. I believe that over time the relative composition of knowledge possessed by the entrepreneur will vary. Thus, entrepreneurs' knowledge sets, as defined above will be studied as to changes that occur over the venture's development. Thus, in subsequent phases, the *entrepreneur's knowledge set* is the comprehensive set of business-related knowledge possessed by the entrepreneur in that subsequent phase. This still includes knowledge related to the venture development process, finance, market-related, management, and technological knowledge, etc.

Networks as outcomes. To account for the dynamics of networks over time, I also examine the characteristics of networks as outcomes. That is, networks as outcomes will be assessed in terms of the comprehensiveness of the set of business-related knowledge possessed by the entrepreneurs' network partners. This, similarly, includes knowledge related to the venture development process, finance, market-related, management, and technological knowledge, etc. Further, network size and the strength of ties are also assessed in subsequent phases of venture development.

To summarize the variables included in my model, Chapter 2 Table 1 has been created and it contains the variable names and their definition.

Chapter 2 Table 1 Summary of Variable Names and Definitions

Variable Name	Variable Definition
<i>Entrepreneurs' Knowledge¹⁸ Sets₁</i>	The set of business-related knowledge possessed by the entrepreneur at venture commitment.
<i>Entrepreneurs' Knowledge Sets₂</i>	The set of business-related knowledge possessed by the entrepreneur 12 months after venture commitment.
<i>Network Knowledge Heterogeneity₁</i>	The set of business-related knowledge encompassed by the entrepreneurs' network partners at venture commitment.
<i>Network Knowledge Heterogeneity₂</i>	The set of business-related knowledge encompassed by the entrepreneurs' network partners 12 months after venture commitment.
<i>Network Size₁</i>	The total number of first-order (direct) actors with whom the entrepreneur interacts at venture commitment.
<i>Network Size₂</i>	The total number of first-order (direct) actors with whom the entrepreneur interacts 12 months after venture commitment.
<i>Strength of Network Ties₁</i>	The intensity of the interactions between the entrepreneur and the network partners at venture commitment.
<i>Strength of Network Ties₂</i>	The intensity of the interactions between the entrepreneur and the network partners 12 months after venture commitment.
Phase 1 Outcomes	
<i>Days to First Sale</i>	The number of days from venture commitment to the first sale of a commercial product or service.
<i>Days to First Full-Time Hire</i>	The number of days from venture commitment to the hiring of the first full-time employee beyond the founder.
Phase 2 Outcomes	
<i>First Year Sales</i>	The dollar amount of sales in the twelfth month following venture commitment.
<i>First Year Venture Size</i>	The number of full-time employees in the twelfth month following venture commitment.

¹⁸ Note that *knowledge* for all variables using this term refers to knowledge related to the venture development process, finance, market-related, management, and technological knowledge, etc.

Expected Relationships

Following from the RBV, KBV, resource dependence theory, and network theory the argument of my model is that entrepreneurs who are developing new ventures will seek to manage their access to and control over important resources relevant to the development of their venture during emergence and early growth. Resources of interest, those that they seek to manage, include business-related knowledge relevant to early stages of venture development. As such, I expected that entrepreneurs will take actions that will allow them to gain access to these resources, and these resources are possessed by those in the external environment. Thus, entrepreneurs will use networks to gain access to these resources. In the process, they will seek to achieve outcomes that will be perceived as desirable and legitimate by external resource holders in hopes of expanding their network to include them, thus allowing them to gain access to needed resources. They will also utilize their prior contacts in hopes of expanding their network to include new, relevant, network partners that possess the knowledge resources that they need. Moreover, the nature of their relationships with resource providers (in terms of network size and the strength of network ties) is expected to impact their ability to gain access to relevant resources. As a result of this process, entrepreneurs' own sets of knowledge will change as a consequence of their interacting with networks such that it decreases their knowledge shortcomings. Finally, the relative success with which entrepreneurs are able to manage their access to needed resources will impact the relative developmental success of the venture.

Next, I develop propositions and hypotheses that correspond to the model of dynamic entrepreneurial networks. I develop within phase relationships that focus on the interactions between the entrepreneur and their networks and the resultant impact on venture development. I

then develop between phase relationships that encompass the dynamic portions of the model. I will explain the dynamics expected in terms of changes in entrepreneurs' knowledge sets over time and I will then explain the dynamics in terms of changes in entrepreneurs' networks knowledge sets over time.

Within phase relationships. The first set of relationships that I consider includes those that occur within phases of venture development. These correspond to propositions 1a and 1b in Chapter 2 Figure 1.

Interaction between entrepreneurs and networks. The research question that propositions 1a and 1b seek to address is: to what extent does the knowledge set of the entrepreneur (entrepreneurs' knowledge sets) interact with network properties (network knowledge heterogeneity and structure) to influence entrepreneurial outcomes? Research indicates that entrepreneurs' characteristics lead to favorable entrepreneurial outcomes (Ronstadt, 1988; Shane, 2000; 2003; Shane & Venkataraman, 2000; Shook, et al., 2003). Other work explains that entrepreneurs' networks lead to favorable entrepreneurial outcomes (Baum, et al., 2000; Brüderl & Preisendörfer, 1998; O'Connor & Rice, 2001; Singh, et al., 1997). Still others have recognized the deficiency in solely relying on only one source of capability (such as individual-level characteristics) and suggest that this deficiency can be countered through integrating other, external, capabilities such as networks (Lee, et al., 2001).

According to the RBV and KBV, knowledge is a main resource necessary for achieving favorable organizational outcomes, especially during early firm development. Some work within entrepreneurship suggests that entrepreneurs, as a result of their prior experience hold specific sets of knowledge (Fiet 1996; Hills, et al., 1999; Ronstadt, 1988; Shane, 2000; 2003; Shook, et al., 2003). Entrepreneurs' knowledge sets at any given period are inadequate due to the inherent

knowledge shortcomings that they possess due to this prior experience (Shane, 2000; 2003). Further, individuals are inherently boundedly rational (Simon, 1947; Thompson, 1967), additionally contributing to the shortcomings in their knowledge sets. Work in economics describes this as “the knowledge problem” (Yates, 2000). According to the knowledge problem, there “will always be information, unknown to the agent that is relevant to their decision” [Yates, 2000: 60]. Therefore, the relationship between entrepreneurs’ knowledge sets and venture development outcomes is constrained by the limited knowledge that entrepreneurs’ possess at any given point. Dew, et al., (2004) refer to this knowledge held by individuals as idiosyncratic knowledge and specialized knowledge.

Other work suggests that networks are a source of knowledge relevant to venture development. Collinson and Gregson (2003), for example, argue that “start-up firms are arguably constrained far more by knowledge limitations than by financial limitations. Networks may ... act as the source of several kinds of critical knowledge or expertise” [2003: 192]. Grant (1996) argues that individuals are essentially specialists, in that they are only knowledgeable to the extent of their prior experience. Further, “production¹⁹ requires the coordination efforts of individual specialists who possess many different types of knowledge” [1996: 112]. Thus, the creation of the firm requires “conditions under which multiple individuals can integrate their specialist knowledge” [1996: 112]. In a complementary argument, Itami and Roehl (1987) discuss the concept of *environmental information* (information that flows from the environment to the firm) as important to firm competitiveness. Within the context of nascent entrepreneurial activity, these notions would suggest that individual entrepreneurs, who are specialists based on

¹⁹ The word “production” was used in a broad sense to include those activities required in the “production” or creation of a firm.

their prior experience, must seek the assistance of other specialists in order to acquire the appropriate knowledge to develop their firms. Networks are one way of doing this.

In synthesizing this research, it appears as though networks provide a critical source of knowledge relevant to the start-up process that may offset the limitations in the knowledge possessed by the entrepreneur alone. Specifically, I believe that the expertise possessed by the entrepreneur can be enhanced by the knowledge in the entrepreneurs' networks. This notion suggests that the interaction between the state of entrepreneurs' knowledge sets at any given time and their networks' knowledge set (heterogeneity) should impact venture development outcomes. This notion is somewhat related to what Kogut and Zander (1992) call "combinative capability." They define this as a dynamic ability of actors to synthesize current and acquired knowledge. As such, they include both the existing knowledge of the entrepreneur as well as propose that knowledge can be obtained from the external environment. The ability to combine and effectively utilize the existing and new knowledge is referred to as combinative capabilities. In their work, they propose that combinative capabilities are helpful in identifying different opportunities relevant to growing a firm. Even though their verbiage seems to suggest an additive relationship between current and acquired knowledge, I believe that the relationship is more multiplicative in nature. This is because I believe that relatively more or less knowledge-resource rich networks should lead to more or less favorable outcomes. Therefore, I propose,

Proposition 1a: In phase 1, phase₁ network characteristics (network size and network knowledge heterogeneity) will moderate the relationship between phase₁ entrepreneurs' knowledge sets and phase₁ outcomes.

Proposition 1b: In phase 2, phase₂ network characteristics (network size and network knowledge heterogeneity) will moderate the relationship between phase₂ entrepreneurs' knowledge sets and phase₂ outcomes.

I believe that the set of knowledge possessed by an entrepreneur in any given developmental phase, being insufficient and subject to shortcomings, may be enhanced by the knowledge resources present in their network. One way to increase the knowledge resources present in the network is through a large number of network partners and specifically by considering the size of the entrepreneurs' networks.

Network size refers to the total number of direct contacts of the entrepreneur. Previous work suggests that larger networks are advantageous in terms of gaining resources such as informational and technological benefits (Shan, et al., 1994). Intuitively, then, entrepreneurs with larger networks should have access to more knowledge as they have additional contacts, each with potentially different knowledge sets. Again, using the rationale within economics, a larger network should contain more individuals with specialized knowledge (Yates, 2000), thus expanding the knowledge resources available to the entrepreneur for producing desired outcomes. This thinking suggests the following hypotheses:

Hypothesis 1a: The size of entrepreneurs' networks of direct contacts will moderate the relationship between entrepreneurs' knowledge sets in phase 1 and phase 1 outcomes of a) days to reach first sale, and b) days to first full-time employee hire such that the larger the network, the fewer days to first sale and the fewer days to first full-time hire.

Hypothesis 1b: The size of entrepreneurs' networks of direct contacts will moderate the relationship between entrepreneurs' knowledge sets in phase 2 and phase 2 outcomes of a) first year sales, and b) first year venture size such that the larger the network, the

higher the first year sales and the greater the venture size (in terms of number of full-time employees).

In addition to the expectation that the size of the network, as a proxy for the amount of knowledge available to the entrepreneur from external contacts, will moderate the relationship between entrepreneur knowledge sets and venture development outcomes, I believe that the comprehensiveness of the knowledge content held by the entrepreneurs' network partners will also moderate this relationship.

More specifically, although some work argues that a larger network may be beneficial in terms of acquiring resources such as knowledge (Shan, et al., 1994), other work proposes that too large a network can actually hinder the ability of actors to utilize and/or process the knowledge gained (due to limitations related absorptive capacity (Cohen & Levinthal, 1990) and cognitive processing limitations) (Deeds & Hill, 1996). This suggests that a more limited, yet knowledgeably comprehensive, set of network partners might be important.

As mentioned in the literature reviewed in Chapter 1, Borgatti, et al. (1998) discuss the *compositional quality* of an actor's network where compositional quality is defined as the relative number of network partners that have the types of characteristics that a focal actor needs (e.g., information regarding new technologies, expertise in certain areas, financial assistance capabilities, etc.). They propose that networks high in compositional quality will lead to more desirable outcomes.

Baum, et al. (2000) refine the notion of compositional quality by investigating a construct they call *network efficiency*. Network efficiency is the diversity of network partners in terms of information and capabilities present such that there is little redundancy. The underlying

argument is that a more parsimoniously diverse group of network partners should provide optimal performance benefits since resources are not wasted on redundant contacts.

The work studying network size, compositional quality, and network efficiency presents a conundrum. That is, is a larger network helpful or harmful? Or, is it a more diverse network that is helpful? Or, rather, is it a more parsimoniously diverse network that is helpful? I argue that the answer to each of these questions is yes. Each factor *is* relevant to new venture development, but relevant during different stages of venture development. In the Baum, et al. (2000) study, their construct of network efficiency at founding was significantly related to only the performance indicators 1) rate of revenue, 2) R&D spending, and 3) rate of patenting. Network efficiency was not significantly related to their two measures of growth—both indicators of growth in employment. Interestingly, the dependent variables that did produce significant results appear to be those more associated with later phases of a venture's development. Thus, based on these results, network *efficiency* might not be advantageous to earlier stage development, at least for outcomes such as growth in employment.

Further, in the study by Deeds and Hill (1996) results suggested an inverted-U relationship between network size and new product development, suggestive of deleterious effects of large networks. However, the average age of the firms included in their study was 7.69 years (sd = 3.80). Since new ventures are generally considered just that—new—when they are 10 years old or younger (Hansen & Bird, 1997; Reynolds & Miller, 1992), and the average age of the firms in their sample of 132 firms was 7.69 years, the applicability of their findings might be restricted to more well-developed firms.

Finally, in their discussions of *compositional quality*, Borgatti, et al. (1998) and Hite and Hesterly (2001) restrict their theorizing to emerging new ventures. They propose that the more

comprehensive an early-stage entrepreneur's network, the more likely desirable outcomes might be achieved. Further, they do not restrict this notion with limitations of network size. I believe that this is because early-stage, nascent entrepreneurs' networks are often somewhat limited to prior contacts resultant from prior experiences. Hite (2005) talks about this in terms of entrepreneurs' early-stage networks being path-dependent based on prior experience.

As the concept of entrepreneurs' network knowledge sets applies to the phases of interest in my model, I believe that the appropriate network knowledge set construct does not presume size as a limitation. Thus, I believe that the more comprehensive an entrepreneur's network is in terms of the knowledge resources held by their contacts, regardless of the size of the network relative to other early-stage entrepreneurs, the more beneficial the network ought to be. This leads to the following hypotheses:

Hypothesis 1c: Entrepreneurs' network knowledge heterogeneity will moderate the relationship between entrepreneurs' knowledge sets in phase 1 and phase 1 outcomes of a) days to reach first sale, and b) days to first full-time employee hire such that the more comprehensive the entrepreneurs' networks knowledge, the fewer days to first sale and the fewer days to first full-time hire.

Hypothesis 1d: Entrepreneurs' network knowledge heterogeneity will moderate the relationship between entrepreneurs' knowledge sets in phase 2 and phase 2 outcomes of a) first year sales, and b) first year in venture size such that the more comprehensive the entrepreneurs' networks knowledge, the higher the first year sales and the greater the venture size (in terms of number of full-time employees).

Between phase relationships. The second set of relationships that I consider includes those that occur between phases of venture development. These correspond to propositions 2 through 4 in Chapter 2 Figure 1.

Dynamic entrepreneur relationships. The research question that proposition 2 seeks to address is: to what degree/extent do entrepreneurs' networks characteristics (network knowledge heterogeneity and network size) affect subsequent entrepreneur attributes (entrepreneurs' knowledge sets)?

According to the KBV, individuals' knowledge is the result of skills and expertise that is accumulated over time. As such, this knowledge must be acquired from some external source (Kogut & Zander, 1992). Itami and Roehl (1987) discuss this notion in terms of the construct, *environmental information*. They define environmental information as "information that flows from the environment to the firm" [1987: 19]. They propose that the amount of information acquired is important in terms of developing invisible assets (based on this and other information), which are a source of competitive advantage as they represent the stocks of information that are accumulated. As such, this information flows to the members of the organization and becomes integrated into their knowledge stocks. Similarly, in developing the KBV and discussing the different types of knowledge, Spender (1996) talks about "knowledge of acquaintance", which refers to the knowledge that is immediately accumulated as the result of experience. Applying these ideas to nascent entrepreneurs in early stages of venture development suggests that the environmental information flowing to the entrepreneur gets accumulated and integrated into their stock of knowledge. Since the information flowing from the environment comes from the entrepreneurs' networks, this suggests that the knowledge sets

of the entrepreneur are likely to change over time as a consequence of interacting with their external environment—their networks. Therefore, I propose,

Proposition 2: Characteristics of entrepreneurs' networks will be associated with a change in entrepreneurs' knowledge sets between phase 1 and phase 2.

With regard to the entrepreneurs' network knowledge heterogeneity, it seems intuitive that the more diverse the set of knowledge resources present within the network, the more comprehensive will become the entrepreneurs' knowledge set. If what Grant (1996), Itami and Roehl (1987), and Spender (1996) assert is true in terms of information and experience from the external environment accumulating within the actors to whom the information flows, then I should expect the comprehensiveness of an entrepreneurs' network knowledge set in one phase to impact the subsequent knowledge set of the entrepreneur. This leads to the following hypothesis,

Hypothesis 2a: There will be a positive relationship between the comprehensiveness of entrepreneurs' network knowledge sets in phase 1 and the entrepreneurs' knowledge sets in phase 2.

Additionally, network size in phase 1 is likely to impact the subsequent character of entrepreneurs' knowledge sets in phase 2. This is because research on network size suggests that larger networks should provide more information and opportunity recognition benefits (Chang, 2004; Lechner, et al., in press; Singh, et al., 1997). Moreover, larger networks are connected with the acquisition of informational and technological resources (Shan, et al., 1994) previously unknown to the actor. Thus, if the increase in network size exposes the entrepreneur to more and potentially diverse information and if knowledge is immediately accumulated as the result of

experience (Spender, 1996), then entrepreneurs' knowledge sets should change as a consequence of the size of their network.

Hypothesis 2b: There will be a positive relationship between the size of the entrepreneurs' networks in phase 1 and the entrepreneurs' knowledge sets in phase 2.

Dynamic network relationships. The research question that propositions 3 and 4 seek to address is: to what extent do entrepreneurial outcomes (days to first sale and days to first full-time hire) and prior network characteristics (network size and strength of ties) affect the subsequent character of entrepreneurs' networks (comprehensiveness of network knowledge set and network size)?

Emerging firms suffer from liabilities of newness and smallness and are consequently deficient in the resources that they need to grow (Stinchcomb, 1965). The reasoning behind this is that emerging firms are characterized by risk and uncertainty. This uncertainty makes gaining access to needed resources difficult as others are reluctant to provide these resources due to an unsure future (Gulati, 1998). On this issue, Hite and Hesterly (2001) note "resource access involves a firm's ability to acquire needed resources. In many instances, new firms are unable to acquire desired resources" [2001: 277].

I propose that one way that entrepreneurs can gain access to needed resources is through reaching benchmarks associated with successful new venture development. In the case of new venture emergence as discussed here, the desired resources are the business-related knowledge sets held by actors in the external environment. In terms of benchmarks associated with successful new venture development, literature studying the stages of venture evolution suggests

specific markers associated with different developmental phases (Katz & Gartner, 1988; Hansen & Bird, 1997; Kazanjian & Drazin, 1991). In the present inquiry, the markers of successful development include days to first sale and days until first full-time employee hire.

Gulati (1998) states that “organizations ... need information about the reliability of ... partners, especially when success depends ... on their behavior” [1998: 300]. In the context of the present inquiry, I assert that the information about the reliability of entrepreneurs can come in the form of reaching desirable venture development outcomes. Then, when these outcomes are reached and entrepreneurs have lessened the perceived riskiness and uncertainty associated with their venture, new resource providers should be willing to interact with the entrepreneurs. This leads to the following proposition,

Proposition 3: The achievement of marker outcomes, indicative of venture development, will be associated with entrepreneurs' subsequent network characteristics.

Specifically, if potential network partners rely on cues received from an emerging venture's performance, then more positive outcomes should lead to more desirable subsequent network characteristics. Relative to the venture emergence and early growth phases of development, the following hypotheses are derived from this expectation.

Hypothesis 3a: There will be a negative relationship between the days to first sale and a) the size of network₂, b) the comprehensiveness of entrepreneurs' network knowledge sets₂, and c) the frequency of weak ties₂ in phase 2.

Hypothesis 3b: There will be a negative relationship between the days to first full-time employee hire and a) the size of network₂, b) the comprehensiveness of

entrepreneurs' network knowledge sets₂, and c) the frequency of weak ties₂ in phase 2.

These relationships are expected as fewer days to first sale and fewer days to the first full-time hire are indicative of a successfully emerging firm. Thus, the less time it takes an emerging venture to reach these markers the more likely it is that additional network partners will be confident in engaging in a relationship. This notion is clear in terms of the expected increase in the size of the entrepreneurs' networks as well as to the level of comprehensiveness of the knowledge resources present in the entrepreneurs' network knowledge sets. However, the connection to weak ties might need some additional explanation.

I expect that there will be a negative relationship between days to first sale and days to first full-time hire and the frequency of weak ties for several reasons. First, weak ties are often associated with bridging ties and bridging ties are thought to provide access to otherwise inaccessible actors (Granovetter, 1973). As such, weak ties are associated with increasing the network size of actors with whom they interact through providing access to these indirect ties. Second, weak ties are based on economic exchange as opposed to possessing a more socioemotional, socioeconomic, or embedded character (Hite & Hesterly, 2001; Hite, 2005). These characteristics of the weak tie partners lessen the need or obligation for these ties to 1) remain a part of the entrepreneurs' network and 2) it lessens the likelihood that they will assist the entrepreneur in expanding their network to include other resource providers. As a result, I expect that the longer it takes for entrepreneurs to develop their ventures in terms of days to first sale and days to first full-time hire, the less willing will weak tie network partners be to 1) remain in their network and 2) help them expand their network to include additional partners with whom they (the weak tie partners) are associated.

Proposition 4 examines the changes in entrepreneurs' networks as a consequence of prior network characteristics. Recall that the theoretical underpinnings of network theory come, at least partially, from resource dependence theory (Pfeffer & Salancik, 1978). As such, it is suggested that actors use networks to gain access to and control over needed resources. Further recall that research studying the nature of firm emergence suggests that different stages of venture development will require different resources to execute phase-relevant, venture-related, activities (Hansen & Bird, 1997; Reynolds & Miller, 1992). Within the context of new venture development, this suggests that one way for entrepreneurs to address these changing resource needs is through their networks. Work studying dynamic entrepreneurial networks suggests just that a change in networks can help to gain access to resources. Greve and Salaff (2003) state that "networks are not fixed; they are the social context of business and can be activated according to different needs" [2003: 2]. Reiterating this assertion, Hite and Hesterly (2001) state "networks of emerging firms evolve in order to adapt to the firm's changing resource needs and resource challenges" [2001: 275]. Although these and others suggest that it is through changes in entrepreneurs' networks over time that lead to gaining access to these needed resources, they do little to specify how, through what mechanisms, and with what results these networks will change over time. I propose that one way through which entrepreneurs' networks change is through their prior networks. Some work recognizes this as a possibility (Gulati, 1999; Gulati & Gargiulo, 1999; Leung, 2003), but they do not explain how or with what network consequences these relationships are possible. I will attempt to do so now.

Some research suggests that entrepreneurs' networks can provide legitimacy to new ventures (Gulati, 1998; Leung, 2003). Often this work examines legitimacy in terms of gaining acceptance in the marketplace. Related work suggests that current networks can provide cues to

other potential network partners as to the legitimacy of new ventures (Larson & Starr, 1993; Lechner & Dowling, 2003; Leung, 2003). I propose that across new venture emergence and early growth phases of development, this notion will manifest itself in terms of the network characteristics of an entrepreneur's network in one phase impacting the subsequent character of their network in future phases. Therefore, I propose,

Proposition 4: The structure of entrepreneurs' networks will be associated with a change in the entrepreneurs' networks between phase 1 and phase 2.

Gulati and Gargiulo (1999) state that "the sheer growth in network density could enhance the legitimacy of partnerships, thus making [other] organizations more eager to build ties" [1999: 1452]. Applying this logic to the networks of nascent entrepreneurs suggests that the size of an entrepreneur's network in the emergence phase should be related to the entrepreneurs' networks characteristics in the early growth phase. The most basic relationship that this logic suggests is that the size of the entrepreneurs' networks in emergence should be positively related to the size of the entrepreneurs' networks in early growth. This idea is consistent with what others have found (Lechner & Dowling, 2003). Through their case analyses, Lechner and Dowling found that within newly emerging technology firms in Silicon Valley, reputational networks early on were "key to creating future options for relations" [2003: 12]. They also note that these relationships tended to be few as they are difficult to garner. Intuitively, then, larger networks are more likely to possess linkages to reputable others and therefore based on previous work larger networks in one phase should be associated with the larger networks in subsequent phases.

Moreover, the size of the entrepreneurs' networks in emergence should lead to a greater level of comprehensiveness in the network knowledge sets in early growth. This is because

individuals are specialized with knowledge based on their idiosyncratic experiences and specialized information (Itami & Roehl, 1987; Yates, 2000). Taken together, these ideas lead to the following hypothesis,

Hypothesis 4a: The size of entrepreneurs' networks in phase 1 will be positively associated a) the size of the network₂ and b) the comprehensiveness of entrepreneurs' network knowledge sets₂ in phase 2.

In addition to the size of entrepreneurs' networks in emergence impacting the subsequent character of their networks during early growth, I believe that the strength of entrepreneurs' network ties will also impact network changes. Strong ties are often associated with cohesive ties (Granovetter, 1973; Burt, 1992). As a result, strong ties are thought to provide access to either contacts that 1) are redundant (already a part of an actor's network) or 2) provide access to similar others. In the first case, there is no change in an entrepreneur's network. In the second case, the size of an entrepreneur's network may increase, but the content of the network should largely stay the same (Granovetter, 1973; Burt, 1992).

On the other hand, weak ties are associated with bridging ties (Granovetter, 1973; Burt, 1992). As a result, weak ties are thought to have access to contacts 1) that are not currently a part of an actor's network, and 2) that have novel information. In the first case, weak ties can impact the size of an actor's network because they can provide access to non-redundant others. In the second case, weak ties can impact the content of an actor's network such that their knowledge base should expand. This leads to the expectation that presence of weak ties in an entrepreneur's network should be associated with a subsequent 1) increase in the size of the entrepreneur's network and 2) increase in the diversity (and therefore comprehensiveness) of the knowledge resources available from future direct network contacts.

Weak ties can also be expected to have another impact on subsequent network characteristics. Specifically, the work of Hite (2005), Lechner and Dowling (2003), Perry-Smith and Shalley (2003), and Hite and Hesterly (2001) provide rationale for why we should expect that weak ties in prior phases should be associated with an increase in the frequency of strong ties in subsequent phases of development. The rationale that they provide is that through interaction, ties that remain through the course of development will tend to become increasingly embedded. That is, weak ties should take on a more socioeconomic and/or socioemotional character over time due to the longevity of interactions. Hite and Hesterly (2001) and Hite (2005) talk about this in terms of the extent of embeddedness of a network relationship. Lechner and Dowling (2003) discuss this idea in terms of the propensity of network ties to become multiplex over time (e.g., social ties may take on an additional economic character and economic ties may take on an additional social character). Finally, Perry-Smith and Shalley (2003) discuss the idea that individuals engaging in creative activity²⁰ will spiral to the center of the network whereby their networks change from being characterized as containing few ties and weak ties to containing many ties and strong ties. Taking from this work, I predict

Hypothesis 4b: There will be a positive relationship between the frequency of weak ties in phase 1 and a) the size of network₂, b) the comprehensiveness of entrepreneurs' network knowledge sets₂, and c) the frequency of strong ties₂ in phase 2.

Chapter 2 Table 2 summarizes the propositions and hypotheses.

²⁰ Entrepreneurship is an inherently creative activity as it involved creating new value in the economy (Shane, 2000).

Chapter 2 Table 2 Summary of Propositions and Hypotheses

Within Phases	
<i>Proposition 1</i>	<i>Proposition 1a: In phase 1, phase₁ network characteristics (network size and network knowledge heterogeneity) will moderate the relationship between phase₁ entrepreneurs' knowledge sets and phase₁ outcomes. Proposition 1b: In phase 2, phase₂ network characteristics (network size and network knowledge heterogeneity) will moderate the relationship between phase₂ entrepreneurs' knowledge sets and phase₂ outcomes.</i>
Hypothesis 1a	<i>Hypothesis 1a: The size of entrepreneurs' networks of direct contacts will moderate the relationship between entrepreneurs' knowledge sets in phase 1 and phase 1 outcomes of a) days to reach first sale, and b) days to first full-time employee hire such that the larger the network, the fewer days to first sale and the fewer days to first full-time hire.</i>
Hypothesis 1b	<i>Hypothesis 1b: The size of entrepreneurs' networks of direct contacts will moderate the relationship between entrepreneurs' knowledge sets in phase 2 and phase 2 outcomes of a) first year sales, and b) first year venture size such that the larger the network, the higher the first year sales and the greater the venture size (in terms of number of full-time employees).</i>
Hypothesis 1c	<i>Hypothesis 1c: Entrepreneurs' network knowledge heterogeneity will moderate the relationship between entrepreneurs' knowledge sets in phase 1 and phase 1 outcomes of a) days to reach first sale, and b) days to first full-time employee hire such that the more comprehensive the entrepreneurs' networks knowledge, the fewer days to first sale and the fewer days to first full-time hire.</i>
Hypothesis 1d	<i>Hypothesis 1d: Entrepreneurs' network knowledge heterogeneity will moderate the relationship between entrepreneurs' knowledge sets in phase 2 and phase 2 outcomes of a) first year sales, and b) first year venture size such that the more comprehensive the entrepreneurs' networks knowledge, the higher the first year sales and the greater the venture size (in terms of number of full-time employees).</i>
Between Phases	
<i>Proposition 2</i>	<i>Proposition 2: Characteristics of entrepreneurs' networks will be associated with a change in entrepreneurs' knowledge sets between phase 1 and phase 2.</i>
Hypothesis 2a	<i>Hypothesis 2a: There will be a positive relationship between the comprehensiveness of entrepreneurs' network knowledge sets in phase 1 and the entrepreneurs' knowledge sets in phase 2.</i>
Hypothesis 2b	<i>Hypothesis 2b: There will be a positive relationship between the size of the entrepreneurs' networks in phase 1 and the entrepreneurs' knowledge sets in phase 2.</i>
<i>Proposition 3</i>	<i>Proposition 3: The achievement of marker outcomes, indicative of venture development, will be associated with entrepreneurs' subsequent network characteristics.</i>
Hypothesis 3a	<i>Hypothesis 3a: There will be a negative relationship between the days to first sale and a) the size of network₂, b) the comprehensiveness of entrepreneurs' network knowledge sets₂, and c) the frequency of weak ties₂ in phase 2.</i>
Hypothesis 3b	<i>Hypothesis 3b: There will be a negative relationship between the days to first full-time employee hire and a) the size of network₂, b) the comprehensiveness of entrepreneurs' network knowledge sets₂, and c) the frequency of weak ties₂ in phase 2.</i>
<i>Proposition 4</i>	<i>Proposition 4: The structure of entrepreneurs' networks will be associated with a change in the entrepreneurs' networks between phase 1 and phase 2.</i>
Hypothesis 4a	<i>Hypothesis 4a: The size of entrepreneurs' networks in phase 1 will be positively associated a) the size of the network₂ and b) the comprehensiveness of entrepreneurs' network knowledge sets₂ in phase 2.</i>
Hypothesis 4b	<i>Hypothesis 4b: There will be a positive relationship between the frequency of weak ties₁ in phase 1 and a) the size of network₂, b) the comprehensiveness of entrepreneurs' network knowledge sets₂, and c) the frequency of strong ties₂ in phase 2.</i>

DISCUSSION

Chapter 2 has sought to do several things. First, network theory is reviewed and specific attention was given to understanding how entrepreneurship researchers have integrated concepts related to network theory into their work. Additionally, I have reviewed the limited amount of work that investigates the dynamics of entrepreneurial networks. Although current research provides us with explanations for the consequences of as well as some antecedents to networks within entrepreneurial settings, most of this work has ignored the inherently temporal and thus dynamic nature of their phenomena. I attempt to build from previous work to explain how over time entrepreneurs' networks impact the development of emerging ventures as well as how these networks are likely to change as a consequence of phenomena related to the emergence of these ventures.

In this paper, I adopted premises from resource dependence theory (Pfeffer & Salancik, 1978) as well as the RBV and its offshoot the KBV (Conner & Prahalad, 1996; Kogut & Zander, 1992). I used these perspectives to argue that due to changes in the resources needed to develop a venture overtime, entrepreneurs will seek to manage and gain access to resources through their networks. Following assertions that have grown from the RBV that note knowledge as one of the most critical resources (especially during early stages of venture development) that entrepreneurs require, I develop my arguments focusing on knowledge as the resource that entrepreneurs seek to manage and access. My work therefore provides an important contribution to the entrepreneurship literature and specifically to the limited work investigating dynamic entrepreneurial networks. Additionally, this work provides a contribution to the RBV and specifically the KBV.

Implications

There are several implications that arise from the current work. The present work recognizes that there are many factors impacting the relative success of new ventures and that many of these factors may not be static in nature. Moreover, although some previous work suggests that through changes in entrepreneurs' networks over time they will gain access to needed resources, they do little to specify how, through what mechanisms, and with what results these networks will change over time. I attempt to explain how through the achievement of certain, legitimizing, outcomes as well as through certain network characteristics, entrepreneurs' networks will change and how certain configurations of network characteristics will lead to relatively different subsequent networks.

I suggest that there may be some systematic ways in which networks do or should change over time and that there may be specific factors impacting the likelihood that 1) these changes will occur and 2) that these changes will lead to desirable entrepreneurial outcomes. In this vein, this work offers an explanation to entrepreneurs as to why some potential network partners may or may not interact with their venture—if the venture has not achieved certain developmental benchmarks, network partners may hesitate to become involved. This potential explanation is suggestive of actions and/or goals that the entrepreneur should strive to perform or achieve.

Further, the model presented suggests that entrepreneurs either voluntarily or not voluntary (and for that matter consciously or not consciously) evolve (their knowledge sets) as a consequence of those that they turn to for help and resources as they develop their new firm. The present work suggests that entrepreneurs should embrace these changes and asks them to recognize that they, along with their ventures, do and potentially must also evolve.

Conclusions

In conclusion, I hope that this work will add to the literature and help entrepreneurs who are pursuing new venture development to understand 1) the causes of their relative success in the venture development process, 2) the causes of the changing nature of their networks, 3) the impact of this process on their knowledge accumulation, and 4) that it suggests certain ways of managing all of these issues. In sum, I hope that my work in this area will help to make the new venture development process less of an enigma and that it will begin to offer some explanations for why some new ventures are successful and why others are not.

CHAPTER 3: METHODS AND RESULTS

This chapter describes the methodology of two studies intended to test the model of dynamic entrepreneurial networks developed in the previous chapter. First, I will present the method and results corresponding to a study undertaken using secondary data from the Panel Study of Entrepreneurial Dynamics database. Second, I will present the method and results corresponding to a study undertaken utilizing primary data from a mass mail survey study that I designed. Chapter Four is the concluding chapter of the dissertation, encompassing an overall discussion of the results across these two studies.

Methods Study One

History of the PSED database

The U.S. Panel Study of Entrepreneurial Dynamics (PSED) is a large scale study initiated by some of the top entrepreneurship researchers across 10 countries (Gartner, et al. 2004). The PSED has produced a public database consisting of longitudinally collected variables about the entrepreneurial start-up process. The impetus and primary objective for the study was to “provide systematic, reliable, data on the basic features of the entrepreneurial or start-up process” [Reynolds, 2000: 160]. A secondary purpose of the study was to provide reliable data on the variables that may explain variations in the relative success of entrepreneurs during the start-up process. Researchers involved in the design of the study based their collections on accumulating panel data for three phases of the start-up process: conception, firm birth, and survival and growth trajectories of new ventures. As such, these researchers participated in a

number of conferences, consortia, and other professional activities to develop the set of variables relevant to their collections. The variables that they collected are too numerous to list here, but a comprehensive discussion of the variables and corresponding items is available in the *Handbook of Entrepreneurial Dynamics: The Process of Business Creation*, published in 2004 by Sage and edited by William B. Gartner, Kelly G. Shaver, Nancy M. Carter, and Paul D. Reynolds.

PSED sample and procedure

One of the advantages of the PSED is that great lengths were taken to identify and survey a representative sample the population of nascent entrepreneurs within the United States (excluding Alaska and Hawaii). To collect this kind of national data, the PSED researchers employed a commercial market research firm that used a random digit dial sampling procedure. A number of screening procedures were used to determine the applicability of the telephone respondent to the PSED study purposes.

Although several samples were screened and included in the data collections, the sample of relevance for testing the hypotheses in my model corresponds to the *nascent entrepreneurs* (NE) sample. To be included in the NE sample, respondents were screened based on the questions 1) “Are you, alone or with others, now trying to start a new business? 2) Are you, alone or with others, now starting a new business or new venture for your employers? An effort that is part of your job assignment?” [Gartner, et al., 2004: 460]. If respondents answered yes to these questions they were then included only if they met three criteria 1) they were going to have ownership in the new firm, 2) if they had been pursuing activities to start the firm within the last year, and 3) if the effort was still in emergence—that is, not an existing firm (Gartner, et al., 2004).

Given the nature of the sample selection described above, I believe that this sample is appropriate for testing my model.

Currently, there have been four waves of data collected (excluding the initial screening), each 12 months apart. Twelve month increments were chosen because the researchers involved agreed that this should allow for sufficient lag time such that the effects of prior actions should be observable. The initial screening began in 1998 and each subsequent follow-up has occurred at 12 month increments. Further, at each follow-up, respondents have been contacted for a telephone interview and with a subsequent mail survey. The terminology used to delineate the waves of data are the initial screening (time 0—discussed briefly above), the first phone (time 1, 12 month follow-up), second phone (time 2—24 month follow-up), third phone (time 3—36 month follow-up), and fourth phone (time 4—48 month follow-up), the first mail (time 1, 12 month follow-up), second mail (time 2—24 month follow-up), third mail (time 3—36 month follow-up), and fourth mail (time 4—48 month follow-up). Following the time 1 data collection, not all variables were included in the next three follow-ups. Instead, only a subset of the initially collected variables was collected through follow-ups 2 through 4. Fortunately, the data relevant for testing some parts of my model are available during subsequent data collection periods.

The sample size of NEs responding as of the first two follow-ups (through time 3) was $n = 256$, although for some this was the first follow up. Although this sample size upon initial inspection seems to be nicely sufficient to test my model, often the consequence of working with secondary data is that the data do not always turn out to be as hearty as one had hoped. Unfortunately, after my detailed review of the data for the variables and time frames necessary to test the portions of my model for which there are variables in the PSED, the sample size appropriate for my use reduced to $n = 59$. That is, in order to test certain hypotheses presented in

my model, I needed to screen the data to identify the NEs that participated in multiple waves of data collection and those that had reported network data in each 12 month increment. However, after working with the data, there were almost no participants that participated in each 12-month data collection. For example, some participants would respond to the initial data collection (time 1) and then not be successfully contacted again until the third or fourth wave of data collection (time 3 or 4). Other times, participants would respond to the time 1 data collection and the time 2 data collection and would never be successfully contacted again. Still other times, participants would respond to the time 1 data collection and never be successfully contacted again. Further complicating the sample size issue was that I found even when participants were successfully contacted across multiple waves of the data collection, the database contained missing data for many of the variables needed to test my hypotheses. To get around this issue and to garner the largest sample size possible for testing my hypotheses, I decided to screen the data to include any participant that reported network data in any two waves of data collection. That is, as long as the participants had two points of complete data for the network variables, they were included in the sample that I used. This left $n = 59$ participants.

Another unexpected disappointment that I had to handle was the fact that based on the variables included in the PSED data collections, I initially thought that I was going to be able to test the hypotheses examining the days to first sale, days to first full-time employee hire, and the number of employees at time 2 (hypotheses H1a, H1b-b, H1c, and H1d-b). After working with the data, of the participants with complete network data for multiple time periods ($n = 59$), none had either a) made a first sale or b) they had not reported (missing data) when they had made a first sale. Further, although some participants did report that they had hired an employee, the network data did not appropriately correspond to the time periods reported for the employee data

and/or the data was incomplete. As a result of these issues, when utilizing the PSED database, I was only able to provide an adequate test of hypotheses H4a (a and b) and H4b (a, b, and c).

The average age of the participants was 39.8 years old. Approximately 70% were males and 65% were White, 28% Black, and 7% other. The average years of full-time work experience for participants was 17.93 years and their average years of work experience in the industry of their new venture was 12.59 years. Approximately 63% reported that their parents were entrepreneurs.

Measures

Due to the fact that I was using secondary data I was constrained to the measures used to collect the data. A benefit of items and scales used to collect much of the PSED data is that they were either a) a modified version of previously validated measures, or b) newly created and pretested measures. Additionally, in some cases where the data were not in the exact form that I would choose to collect, other data were available to either a) calculate the variables that I would prefer or b) proxy variables that get to the underlying logic of the variables in my study were available.

Specifically, variables relevant to my model that were collected include: network size, the strength of network ties, and the comprehensiveness of entrepreneurs' network knowledge sets.

Network size. For the initial wave of data collection, the size of the entrepreneurs' networks was assessed through an item asking "Are there people, those that would NOT be on the start-up team, who have been particularly helpful in getting the business started? How many are there?" The number of helpers reported for this item indicates the size of the entrepreneurs'

networks. Subsequent phases of data collection asked “Are there other people, not on the start-up team and not already mentioned, who have been particularly helpful to you in getting the business started (since our previous interview)? How many are there?” For the subsequent phases of data collection, I calculated the network size as the total number of helpers in the initial phase plus any newly reported network partners in the subsequent data collection phase.

Utilizing a simple count of network partners as an indicator network size is consistent with the work of others (cf., Perry-Smith, 2006; Smith, Collins, & Clark, 2005; Burt, 2000; 2001; 2004; Baum, et al, 2000; Burt, Hogarth & Michard, 2000; Burt & Ronchi, 1994).

Weak and strong ties. The frequency of weak and strong ties was assessed using a count measure of the number of network partners that were classified as corresponding to different network partner types. Specifically, participants were asked to respond to the following item about each of their five most important helpers: “How would you describe your relationship to (name)? (is/was) (name) your spouse or partner; a family member or relative; a business associate or work colleague; a friend or acquaintance; a teacher or counselor, or (do/did) you have some other type of relationship with (name)?” Partners were classified and counted as a weak tie partner if they were reported to be a business associate/work colleague, teacher/counselor, other, or don’t know. Partners were classified and counted as a strong tie partner if they were reported to be a spouse/partner, relative/family member, and/or a friend/acquaintance. This classification is consistent with the work of others (Greve & Salaff, 2003; Leung, 2003; McDonald & Westphal, 2003). Also, although it could be argued that including the classification friend/acquaintance as a strong tie is somewhat dubious as acquaintances are not generally considered close contacts, the results of the data analyses did not change when including this group of partners as strong tie or as weak ties.

Network knowledge heterogeneity. Network knowledge heterogeneity was assessed by utilizing Blau's (1977) index of heterogeneity to calculate the relative comprehensiveness of the entrepreneurs' networks in terms of business-related knowledge (Perry-Smith, 2006; Smith, et al., 2005; Baum, et al., 2000; Gulati, 1999; Westphal & Zajac, 1997).

Respondents were asked to respond to the following item for their five most important contacts: "Which of these forms of assistance from (NAME) has been the most important for the new business start-up? 1) introductions to other people, information or advice, training in business related tasks or skills, access to financial resources, physical resources, business services, personal services, moral/emotional support, labor, creativity or idea." Based on participants' responses, I calculated the index of heterogeneity (Blau, 1977) of the knowledge present within their network using the formula $1 - \sum p_i^2$ where p is the proportion of direct contacts in each knowledge category and i is the number of different knowledge categories represented. The range of the index is 0 to +1 where numbers closer to +1 indicate a more knowledgably comprehensive network. For example, assume that an entrepreneur that has 10 network partners and that there are a maximum of 5 total potential knowledge types. If within that entrepreneur's network, the partners possess knowledge of three different knowledge types, the index of heterogeneity for that entrepreneur's network would be 0.66.

$$\begin{aligned}
 &= 1 - [(3/10)^2 + (4/10)^2 + (3/10)^2 + (0/10)^2 + (0/10)^2] \\
 &= 1 - [.09 + .16 + .09 + 0 + 0] \\
 &= 1 - .34 \\
 &= 0.66
 \end{aligned}$$

Now, consider another entrepreneur with 10 network partners that have 4 of the 5 knowledge types between them.

$$\begin{aligned}
 &= 1 - [(3/10)^2 + (2/10)^2 + (3/10)^2 + (2/10)^2 + (0/10)^2] \\
 &= 1 - [.09 + .16 + .09 + .04 + 0]
 \end{aligned}$$

$$\begin{aligned} &= 1 - .26 \\ &= 0.74 \end{aligned}$$

In this example, the second entrepreneur has the most knowledgeably comprehensive network.

Controls. Previous research, and logic, suggests that entrepreneurs whose parents were/are entrepreneurs have better success with their ventures (Aldrich, Renzulli, & Langton, 1998; Davidsson & Honig, 2003). Although parents and other kin can be considered to be a part of entrepreneurs' networks, beyond the specific business-related knowledge that they provide as network partners it will be necessary to control for the additional effects that have been observed in the literature (Aldrich, et al., 1998; Davidsson & Honig, 2003). Therefore, I controlled for whether or not an entrepreneur's parents were self employed. I additionally controlled for the entrepreneurs' age, since age has been associated with impacting the entrepreneurial process (Reynolds, 2004; Reynolds, 1997). This was simply included as a continuous variable of the entrepreneur's age.

Results

Variable means, standard deviations, and zero-order correlations are reported in Chapter 3 Table 1.

**Chapter 3 Table 1 Descriptive Statistics and Correlations
(PSED Sample)**

<i>Variables</i> ^a	Mean	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
1. Network Size <i>t</i> ₁	2.44	1.51	1.00									
2. Network Size <i>t</i> ₂	4.45	2.87	.43	1.00								
3. Network Knowledge Heterogeneity <i>t</i> ₁	.29	.28	.58	.17	1.00							
4. Network Knowledge Heterogeneity <i>t</i> ₂	.54	.16	.35	.16	.61	1.00						
5. # of Weak Ties <i>t</i> ₁	.66	.96	.15	-.03	-.01	-.13	1.00					
6. Ratio of Weak Ties <i>t</i> ₁	.27	.39	-.02	-.12	-.06	-.13	.89	1.00				
7. # of Strong Ties <i>t</i> ₂	2.75	1.56	.41	.28	.34	.28	-.66	-.75	1.00			
8. Ratio of Strong Ties <i>t</i> ₂	.70	.34	-.06	.11	-.00	.15	-.85	-.89	.79	1.00		
9. Age	39.83	10.97	.17	.02	.02	.23	-.03	-.06	.01	-.03	1.00	
10. Parent	1.37	.49	.17	-.04	-.01	.15	.13	.19	-.08	-.21	.18	1.00

^a Zero-order correlations are reported.

n = 59, values above .27 are significant at .05 and values above .29 are significant at .01, two-tailed test
values above .22 are significant at .05 and values above .33 are significant at .01, one-tailed test

All hypotheses were tested using multiple regression analyses and all regression results are reported in Chapter 3 Table 2. All variables were assessed to evaluate their conformity to the assumptions required for running OLS regression. In a couple of instances (e.g., network size t_1 and network size t_2), results suggested that the data were non-normally distributed. In these cases, data were log transformed (natural log) such that the data then became normally distributed (Mertler & Vannatta, 2002). The analyses were run using the transformed and non-transformed derivations of the variables for comparison. The results were unchanged as a consequence of transforming the variables and so the non-transformed variables are included in the regression data reported here.

Chapter 3 Table 2 Results of Multiple Regression Analysis for Hypothesized Relationships PSED Sample^a

Variable	Network Knowledge Heterogeneity t_2	Network Size t_2	# of Strong Ties t_2
<i>Controls</i>			
Age	.15	-.05	-.01
Parent Entrepreneurs	.09	-.10	.01
<i>Predictors</i>			
Network Size t_1	.34**	.47***	
# of Weak Ties t_1	-.19	-.09	-.67***
R ²	.19	.21	.44
Adjusted R ²	.13	.15	.41
F	3.18**	3.57**	13.62***

^a N=59. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, † p < .10, one-tailed.

The regression results testing hypotheses 4a (a and b) and 4b (a, b, and c) are presented in Chapter 3 Table 2.

Network knowledge heterogeneity t₂. The models examining network knowledge heterogeneity t₂ as a dependent variable predicted that the size of entrepreneurs' networks at t₁ and the frequency of weak ties t₁ would be positively associated with the heterogeneity of the knowledge in their network t₂. As can be seen in Chapter 3 Table 2, the overall model is significant ($R^2 = .19, F = 3.18, p < .01$).

Hypothesis 4a-b predicted a positive relationship between the size of entrepreneurs' networks t₁ and network knowledge heterogeneity t₂. Hypothesis 4b-b predicted a positive relationship between the frequency of weak ties in entrepreneurs' networks t₁ and network knowledge heterogeneity t₂. The analyses suggest that network size t₁ is positively and significantly related to network knowledge heterogeneity t₂ ($\beta = .34, p < .01$), supporting hypothesis 4a-b. The frequency of weak ties t₁, however, was not related to network knowledge heterogeneity t₂ ($\beta = -.19, p > .05$), not supporting hypothesis 4b-b.

Network size t₂. The models examining network size t₂ as a dependent variable predicted that the size of entrepreneurs' networks at t₁ and the frequency of weak ties t₁ would be positively associated with the network size t₂. As can be seen in Table 2, the overall model is significant ($R^2 = .21, F = 3.57, p < .01$).

Hypothesis 4a-a predicted a positive relationship between the size of entrepreneurs' networks t₁ and network size t₂. Hypothesis 4b-a predicted a positive relationship between the frequency of weak ties in entrepreneurs' networks t₁ and network size t₂. The analyses suggest that network size t₁ is positively and significantly related to network size t₂ ($\beta = .47, p < .001$), supporting hypothesis 4a-a. The frequency of weak ties t₁, however, was not related to network size t₂ ($\beta = -.09, p > .05$), not supporting hypothesis 4b-a.

Frequency of strong ties t₂. The models examining the frequency of strong ties t₂ as a dependent variable predicted that the frequency of weak ties t₁ would be positively associated with the frequency of strong ties t₂. As can be seen in Table 2, the overall model is significant ($R^2 = .44, F = 13.62, p < .001$).

Hypothesis 4b-c predicted a positive relationship between the frequency of weak ties t₁ and the frequency of strong ties t₂. The analyses suggest that the frequency of weak ties t₁ is negative and significantly related to the frequency of strong ties t₂ ($\beta = -.67, p < .001$). Although a significant relationship was found, it was in the opposite direction than was predicted, not supporting hypothesis 4b-c.

Overall, the results of study one suggest that hypothesis 4a was wholly supported as indicated by the positive and significant relationship between the size of entrepreneurs' networks t₁ and the size of their networks t₂ and the comprehensiveness of entrepreneurs' network knowledge sets t₂. Hypothesis 4b, however, was not supported as indicated by the non-significant findings and the significant and negative findings.

Methods Study Two

Sample and Procedure

Study Two presents the results of a mass mailing survey study that assessed the dynamics of nascent entrepreneurs' networks in the state of Florida. A modified version of Dillman's (2000) five-point contact method was utilized in combination with other aspects of his tailored design method in order to increase the potential response rate achieved from the study. The mass mailing was undertaken in January 2006.

The task of identifying an appropriate sample for the study that would not require substantial amounts of retrospective recall data entailed locating a number of nascent entrepreneurs that were in the very early stages of venture development (e.g., in emergence or in early growth). This was particularly important as many of the hypotheses to be tested involved assessing entrepreneurial and network outcomes that occurred 12 months following founder commitment to pursuing the venture. Further complicating issues was the notion of identifying an objective benchmark that equally signified when the entrepreneurs in the sample committed to pursuing the venture. That is, researchers that have focused on identifying the stages of venture emergence and growth have suggested that venture emergence begins when the entrepreneur has begun seeking of information useful for starting a new organization or filed for some preliminary business license and that venture birth occurs and early growth begins when the first commercial sale or first employee hire is achieved (Hansen & Bird, 1997; Reynolds & Miller, 1992; Hansen, 1991; Kazanjian & Drazin, 1989; Katz & Gartner 1988).

To identify an appropriate sample that met these requirements and also to integrate a more objective indicator of when venture emergence began so as to obtain more valid data, I selected the date that a founder filed for incorporation as an indicator of the date that the founder committed to pursuing the venture. Since the initial mailing of the survey was to go out in January 2006, I identified all of the firms that filed for incorporation in the state of Florida in January 2005 (n = 16,543). I chose to survey founders that incorporated exactly one year prior to my survey time period in hopes of 1) lessening the potential biases due to retrospective recall (Huber & Power, 1985), 2) to obtain real time data (versus retrospective) in the twelfth month after committing to the venture, and 3) to ground the data collection with an objective indicator of the date of commitment to pursuing the venture.

Further to lessen the potential for retrospective recall problems, following the recommendations of Huber and Power (1985) I, 1) encouraged participant accuracy of data by ensuring confidentiality via coding, 2) chose time periods and events that were likely to be highly emotional (e.g., incorporation), 3) conducted pretests and interviews with other entrepreneurs to see if the events of interest were salient enough to elicit accurate responses²¹, 4) pretested the survey for clarity and made modifications where necessary²², 5) indicated the time required to complete the survey in the cover letter, and 6) included a description of the practical importance of the study to the entrepreneurs being asked to participate.

To identify every founder that filed for incorporation in the state of Florida in January 2005, I was able to access the online database of individual firm filings from the State of Florida website. After talking with the record keepers at the State of Florida on numerous occasions, I was able to identify the algorithm used to maintain the records of all incorporation filings. That is, using this algorithm I was able to gain access to the incorporation filing records of each of the individual records for for-profit firms for which there were incorporation filings in January 2005. I then hired a technology specialist to write a computer script to download all of the firm filings for January 2005 and put them in an Excel spreadsheet.

²¹ Specifically, I interviewed three entrepreneurs, each of whom had incorporated their firm somewhere between 1 year and 20 years prior to the interview. Without hesitation, all of these entrepreneurs were equally able to identify their incorporation date, the date of their first sale and first hire (and interestingly, although not a part of the study, they were able to recall the name of the customer and in some cases the exact amount of their first sale) as well as the network partners that helped them during incorporation. I requested to view supporting paperwork for objectively verifiable variables and their reports were confirmed. As a result of the robust ability of these entrepreneurs to recall the variables of interest to my study, I felt confident in utilizing retrospective recall for phase I inquiries.

²² The survey was pretested two times. First, the survey was pretested with two entrepreneurs who were different from the three used to determine if retrospective recall was a problem. These entrepreneurs suggested some changes to the format and wording of some items and instructions. After these changes were implemented, the surveys were pretested, the time to complete the survey was recorded, and post-survey interviews were conducted with three clients of the University of Central Florida Technology Incubator, all different from the two previous interviews and pretests. A few, minor, suggestions were made and these were integrated in the final version of the survey.

After all of the records were assembled into an Excel spreadsheet, I screened the database to remove any questionable records prior to random founder selection. Specifically, I removed 1,370 firms for which duplicate addresses, duplicate registered agent names, or duplicate registered agent addresses were reported, leaving 15,173 firms. My reasoning for removing these firms was that there could be something systematically different about firms or individuals who have filed for multiple incorporations in the same month when compared to the population of other nascent entrepreneurs. Then I removed 2,522 firms for which the registered agent was a company, such as an attorney or incorporation filing agency, leaving 12,651. The reason for this was that the contact information for these firms was a corporation or other agency as opposed to the actual founder of the firm, which suggests that there could be some bias integrated into the study if they were included and I could not guarantee that the survey would reach the target respondent. Next, I removed 328 firms where the registered agent was indicated as a P.A., Esquire, or CPA, leaving 12,323 firms. These firms were also removed because I was not definitively able to contact the founder directly. Finally, two records seemed to have errors in their data and so I removed them from the potential sample, leaving 12,321 firms from which 2,000 would be randomly selected. Of the remaining 12,321 founders that filed for incorporation in state of Florida in January 2005, I identified a random sample of 2,000 founders using a random numbers table.

Following Dillman's (2000) five-points of contact method, in January 2006 I first mailed the 2,000 randomly selected founders a brief prenotice letter to let them know that a few days later they would be receiving a survey from me and that their participation would be very much appreciated. A few days following the prenotice letter I sent the initial questionnaire mailing that included 1) a detailed cover letter explaining why a response from the participant was important

and ensuring their confidentiality, 2) a copy of the survey, 3) a one dollar incentive, and 4) a self address stamped (actual stamps, not metered postage) return envelope.

For the cover letter in the first survey mailing, following Dillman's (2000) suggestions, I drafted the letter to conform to excerpts that his work has found to be important for increasing response rates. During the Institutional Review Board (IRB) review process, however, the cover letter wording was modified slightly to conform to their requirements. The general feeling of the letter remained intact.

To increase the potential response rate I also included \$1.00 in this initial survey mailing. One dollar was selected as the incentive amount as Dillman "... consider[s] one dollar the smallest practical amount to send" [2000: 168]. I also included a stamped envelope for the return envelope, as Dillman reports that actual stamped envelopes can increase response rates up to several percentage points over those that utilize a business reply or bulk mailing rate. For the outgoing envelopes metered postage was used for all mailings, which was appropriate as Dillman suggests that he has found no experimental evidence that the use of actual stamps on the outgoing envelopes produces higher response rates.

Finally, with regard to the first survey mailing, Dillman (2000) advises that two things need to occur when the respondent opens the mailout envelope: 1) all of the contents (all four parts—the cover letter, the survey, the dollar, and the return envelope) need to come out of the envelope at once, and 2) the appealing parts of each insert/element need to be visible immediately when opened. Dillman also suggests that these issues are especially important when flat mailouts are being used for 8 ½" X 11" booklets, which was the case in this mailing. For these types of mailings, it is suggested that the incentive be attached with a sticker or some other device and that if tearing can be prevented that the entire packet be assemble utilizing a

metal clip. To accomplish these ends, the cover letter, survey, return stamped envelope, and dollar were held together with a paper clip such that when removing the contents, the participant could see the letterhead, the dollar, the return envelope, and the actual stamps on the return envelope.

One week following the initial survey questionnaire mailing, a third contact was mailed. A postcard was sent to all 2,000 randomly selected respondents thanking those who had responded and reminding those that had not yet responded to please complete the survey. Further, participants were told that if they had misplaced the initial survey that in about a week they would be receiving an additional survey in the mail.

One week after the thank you/reminder postcards were sent, I initiated the final contact of Dillman's method that I would be undertaking. I mailed all nonrespondents a final, replacement, copy of the survey in a packet that included a cover letter, the survey, and a stamped return envelope, assembling the contents so that when opened the appealing parts of each insert/element was immediately visible. In the cover letter, I requested that if the nonresponse was due to reasons such as the respondent not having started a business that the participant return the survey with a note indicating that case. I also requested that if the respondent declined participating in the study, that they return the survey either blank or with a note indicating that case, so that I could account for their nonresponse.

Of the 2,000 mailings sent, 288 were returned to me as "return to sender", indicating that these businesses had either relocated or were out of business. To try to determine the fate of these organizations, I randomly selected 30 of the return to sender firms and tried to locate them online and via the phone book as I had the firm names, the registered agent's name, and the address used to file incorporation papers. I was, however, unable to locate *any* of the firms

utilizing any of these queries. This left me to assume that the 288 return to sender mailings corresponded to ventures that had likely gone out of business versus due to them relocating. This assumption is likely to be accurate as I was unable to locate any information about any of the 30 I researched and an address change request with the US Postal Service would likely still have been active when my mailings were sent. After accounting for the 288 return to sender mailings, this left 1,712 potential respondents.

Of the 1,712 potential respondents, 26 were returned to me as being received in error. These 26 respondents indicated that they had not been involved with founding a firm, leaving 1,686 potential respondents. Of the 1,686, 338 were sent back (20.05%), although many were not completed correctly, comprehensively, or they indicated that they declined participation in the study. Specifically, 58 were not completed correctly or completely enough to warrant leaving them in the sample and 62 respondents decline participation, leaving 218 (12.93%).

Of the 218 founders that responded properly, I screened the data to make sure that firms to be included in the analyses were not operating prior to incorporation, which would potentially bias the results that are intended to apply to new (and young) ventures. As an additional check to make sure that the data reported were for newly formed, and thus young, firms I screened the data to identify any firms that were reported as being incorporated at a different time period than that for which the survey was sent. This screening was undertaken as a precaution against three potential biases.

First, if founders inaccurately report the incorporation date of the firm to which the survey was intended to apply, then other responses in the survey might have been biased as a result of various decision-making or retrospective recall biases, thus compromising the accuracy of the data. Second, many entrepreneurs start multiple firms (often called serial entrepreneurs).

In this case, it is possible that a founder might answer the survey questions with regard to a different venture undertaking than that for which the survey was intended and/or there might be some other systematic difference with these respondents versus others. Finally, after screening the data, talking with Florida State Corporation Department employees, and after reading some comments provided to me by some entrepreneurs on the survey, there were some cases that I identified where the venture had been in existence prior to incorporation. A number of reasons had been cited for the recent incorporation such as concerns for liability issues, tax issues, and changing the name of the venture. In the interest of avoiding any biases that might come with issues such as these, I removed firms from the sample if the founder reported that the firm had been incorporated at a different date than was specified for the survey. This eliminated an additional 44 firms, leaving the final sample size at $n = 174$ with a final response rate of 10.32%.

In order to determine if there was something significantly different across the respondents and nonrespondents to the survey, I randomly selected 150 of the nonrespondents (roughly 10% of those not responding) and tried to locate their contact information via conducting a web Google search for the name of the company and the address that I had on record from the Florida State Corporations database. Of the 150 randomly selected nonrespondents, I was only able to locate the contact information for five firms. One additional firm's website was identified but it was no longer in service. For the five firms that I was able to locate, I telephone them and asked them three questions: 1) Including the owner(s) of the firm, how many full-time employees currently work for the firm, 2) How long has the firm been running, and 3) What position do you have within the company (the position of the person answering the telephone)?

Based on the responses to question number one (number of employees), an independent-samples t-test was calculated comparing the mean score of the respondents to the

nonrespondents. No significant difference was found ($t(174) = -.12, p > .10$). The mean of the respondent group ($\mu = 1.84, sd = 2.35$) was not significantly different from the mean of the nonrespondent group ($\mu = 2.00, sd = 1.73$). Although the results of this test suggest no difference across respondents and nonrespondents in terms of number of employees and a random selection procedure was used for identifying nonrespondents to contact, given that I was unable to locate 144 of the 150 nonrespondents attempted, overall results should be interpreted with caution when generalizing to the population of nascent entrepreneurs incorporating in the state of Florida. On the other hand, because many sources (cf., Barringer & Ireland, 2006; Watson & Everett, 1996; Gaskill & Van Auken, 1993) cite that the failure rate for firms in their first year of operations ranges between 20% and 50%, the five firms contacted might truly be representative of the population of nonrespondents. Further, if 20-50% of the firms that I sampled were no longer in existence then my effective response rate was actually much higher than the 10.32%. This does, however, raise the question of my findings and sample being biased toward successful firms and I will return to this issue in the Chapter Four limitations section.

For respondents the average age of the participants was 45 years old. Approximately 70% were males and 69.5% were White, 2% Black, 22.4% Hispanic, and 6.1% other. The average years of full-time work experience was 24.11 years and the average years of work experience in the industry of their new venture was 11 years. Approximately 50.5% reported that their parents were entrepreneurs. 55.5% of the respondents had at least a four-year college degree. Finally, 116 firms in the sample were solo-founded ventures and 58 were founded by a team²³.

²³ Although not included in the analyses reported, I conducted some sensitivity analyses that controlled for whether the firm was founded by a team or by a solo entrepreneur. The results were unchanged. However, in some post hoc

Measures

Network size. To assess the size of entrepreneurs' networks at the date that they committed to pursuing the venture, participants were asked to list the names (first name and last initial only) of the people that were particularly helpful to them as they started and/or developed their firm at incorporation, January 2005. Utilizing a name generator method to identify relevant network contacts is the primary method used by researchers interested in studying entrepreneurial and organizational networks (cf., Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000; 2001; 2004; Baum, et al, 2000; Burt, et al., 2000; Burt & Ronchi, 1994).

To assess the size of entrepreneurs' networks one year following their commitment to pursuing the venture, participants were asked to list the names (first name and last initial only) of the people that "are currently a source of help". Space on the survey allowed for the respondents to list up to 20 network contacts, which is the upper limit of the number of contacts that researchers ask about in network studies (Burt, 2000, 2001; 2004). Further, inspection of the literature suggests that the average number of contacts generally reported is well within this range with Reagans and McEvily (2003) finding a mean number of contacts of 2.8 contacts, McDonald and Westphal (2003) reporting a mean number of contacts as ranging from 2.23 to 6.76, and Aldrich and Carter (2000) reporting that about 89% of their sample reported having between one and four network partners and 14% reported having 5 or more network partners. The network size at incorporation (January 2005) and twelve months later (January 2006) was simply the count of the network partners reported for these time periods (Perry-Smith, 2006; Smith, et al., 2005; Baum, et al., 2000; Burt, 2000; 2001; 2004).

analyses, I split the samples and tested the hypotheses again and I found one difference for hypothesis 1b-b that will be discussed in Chapter 4.

Weak and strong ties. The frequency of weak and strong ties was assessed as the count measure of the number of network partners that were classified as corresponding to weak or strong tie partner types. Researchers have struggled with the best method for assessing the strength of network ties and have gone about determining the strength of ties in a number of ways, all of which I used for comparison sake. That is, researchers have, with few exceptions used a single measure of tie strength like the relation of the network partner to the entrepreneur (e.g., family/friend versus acquaintance), the closeness of the relationship, the frequency of interaction, and the duration of the relationship (Perry-Smith, 2006). The appropriateness of treating these as dimensions of strong or weak ties is subject to theoretical debate and psychometric assessments of these as dimensions have not yet suggested that combining them is appropriate (Perry-Smith, 2006; Marsden & Campbell, 1984). Coupled with the theoretical debate and similar to reports from Perry-Smith (2006), in this study the reliabilities were too low to warrant combining these as dimensions and so they were treated separate ($\alpha = .63$). Further, although not the goal of this work, all of the hypotheses were tested and the results were compared using the different methods for assessing the number of weak and strong ties. The results were largely the same across measurement methods and Chapter Four includes a discussion of the results of this comparison.

The results included in the tables discussed in the results section for this study include network partners classified as weak or strong ties based on their relation to the entrepreneur (e.g., family member, friend, acquaintance, etc.) (Greve & Salaff, 2003; Leung, 2003; McDonald & Westphal, 2003; Aldrich & Carter, 2004). Participants were asked to classify each network partner listed in the name generator portion of the survey as a family member, friend, or acquaintance. Partners classified as a family member or friend were counted as a strong tie and

those classified as an acquaintance were classified as a weak tie (Greve & Salaff, 2003; Leung, 2003; McDonald & Westphal, 2003).

The other items that were included in the survey to assess weak and strong ties included items to assess closeness, frequency, and duration of the relationships. For closeness, an item asked respondents to indicate for each person listed in the name generator portion of the survey, how close their relationship was at incorporation (January 2005) and now (January 2006) on a 5-point scale that ranged from 1 = not close at all to 5 = extremely close (Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004). Strong ties were classified as contacts that were extremely close or very close contacts (Perry-Smith, 2006). For frequency, an item asked both at incorporation (January 2005) and now (January 2006), “On average, how often did/do you interact with this person? (Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004). Contacts with whom the entrepreneur interacted daily or several times a week were classified as strong ties and others were considered weak ties (Perry-Smith, 2006; Nelson 1989). Finally, for the duration measure, participants were asked “On average, how long have you known this person? (years/months)” (Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004). Any tie that the entrepreneur had known for 10 or more years was counted as a strong tie with all other ties being weak (Perry-Smith, 2006).

Network knowledge heterogeneity. Network knowledge heterogeneity was assessed by utilizing Blau’s (1977) index of heterogeneity to calculate the relative comprehensiveness of the entrepreneurs’ networks in terms of business-related knowledge (Perry-Smith, 2006; Smith, et al. 2005; Baum, et al., 2000; Gulati, 1999; Westphal & Zajac, 1997).

For each contacted listed in the name generator portion of the survey, respondents were asked to identify the sources of business-related help that each contact provided them at

incorporation (January 2005) and now (January 2006). The list of business-related areas were selected, as they were thought to represent a comprehensive list of value-chain/business functional areas for which at least some knowledge would be required to successfully start a business (Smith, et al., 2005; Baum, et al., 2000; Burt, 2000; 1994). Areas included were: accounting, engineering/research, finance, general management, human resources, legal, manufacturing/production, marketing/distribution, sales (customer origination), service (customer support), and technology. Based on participants' responses, I calculated the index of heterogeneity (Blau, 1977) of the knowledge present within their network using the formula $1 - \sum p_i^2$ where p is the proportion of direct contacts in each knowledge category and i is the number of different knowledge categories represented. The details of using this formula were discussed in the measures section for Study One.

Entrepreneurs' knowledge set. In order to assess the comprehensiveness of entrepreneurs' business-related knowledge/expertise, entrepreneurs were asked to indicate their expertise in the same 11 knowledge areas used to assess their networks' knowledge heterogeneity in January 2005 and January 2006. The relative comprehensiveness of the founders' expertise was calculated as the ratio of expertise areas reported to total knowledge areas.

Days to first commercial sale. In order to measure the number of days from when the entrepreneur committed to pursuing to the venture to the date of the first commercial sale, an item asked respondents to indicate the month and year of the first commercial sale for the firm since incorporating (January 2005) (Hansen & Bird, 1997; Hansen, 1991; Katz & Gartner, 1988).

Days to first full-time employee hire. To measure the number of days from when the entrepreneur committed to pursuing to the venture to the date of the first full-time employee hire

beyond the founders of the firm, an item asked respondents to indicate the month and year of the first employee hire for the firm beyond the founder(s) since incorporating (January 2005) (Hansen & Bird, 1997; Hansen, 1991; Katz & Gartner, 1988).

First year sales. Sales in the twelfth month since committing to pursue the venture was assessed by asking respondents to indicate “the total dollar amount of sales for the firm as of the 12th month after incorporation—January 2006)” (Hansen & Bird, 1997; Hansen, 1991; Katz & Gartner, 1988). For interpretation purposes, sales figures were log-transformed (natural log) in the results later reported, consistent with others (cf., Baum, et al., 2000).

First year venture size (in terms of number of employees). Venture size in the twelfth month after committing to pursue the venture was assessed by asking respondents to indicate the number of “full-time employees that are currently employed by the firm (including those that share ownership)” (Hansen & Bird, 1997; Hansen, 1991; Katz & Gartner, 1988).

Controls. Previous research, and logic, suggests that entrepreneur’s whose parents were/are entrepreneurs have better success with their ventures (Aldrich, et al., 1998; Davidsson & Honig, 2003). Although parents and other kin can be considered to be a part of entrepreneurs’ networks, beyond the specific business-related knowledge that they provide as network partners it will be necessary to control for the additional effects that have been observed in the literature (Aldrich, et al., 1998; Davidsson & Honig, 2003). Therefore, I controlled for whether or not entrepreneurs’ parents were self employed. I additionally controlled for the entrepreneurs’ age, since age has been associated with impacting the entrepreneurial process (Reynolds, 2004; Reynolds, 1997). This was simply included as a continuous variable of the entrepreneurs’ age.

Given the nature of the relationships being tested and the sampling framework used, I controlled for two other factors. First, I controlled for the extent to which the respondent started

the firm with the intention to grow it to become a large firm (Likert-type scale of 1 to 5 where 1 = completely disagree and 5 = completely agree) as growth intentions might impact the desire and results of sales and number of employees hired in the first year. Second, I controlled for the extent to which the respondent started the firm with the intention to sell the firm (e.g., achieve a liquidity event) (Likert-type scale of 1 to 5 where 1 = completely disagree and 5 = completely agree), as both networking characteristics and venture growth variables might be somehow influenced by this intention.

Results

Variable means, standard deviations, and zero-order correlations are reported in Chapter 3 Table 3.

All hypotheses were tested using multiple regression analyses and all regression results are reported in Chapter 3, Tables 4 through 6. The usable data was analyzed for missing data and following Mertler and Vannatta (2002), the series mean was imputed for those with missing values. This method was used as it is somewhat of a conservative method because the overall mean of the variable does not change as a consequence of inserting the mean value for the missing cases (Mertler & Vannatta, 2002). In addition, the data analyses were conducted both with and without the cases involving missing data to ensure that the results are similar and thus robust. The results for all hypotheses were the same when examining the results both with the series mean imputed and without.

Chapter 3 Table 3 Descriptive Statistics and Correlations (Mass Mail Sample)

<i>Variables</i> ^a	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. # Days to 1 st Hire	79.21	126.75	1.00												
2. # Days to 1 st Sale	200.27	133.29	.20	1.00											
3. # Current Employees	1.84	2.35	.40	.17	1.00										
4. Ln \$ Sales January 2006	9.03	5.17	.25	.79	.28	1.00									
5. Entrepreneur Expertise 2005	.28	.22	.01	.06	.18	.07	1.00								
6. Entrepreneur Expertise 2006	.33	.25	.08	.14	.24	.13	.88	1.00							
7. Network Size 2005	4.27	3.50	-.01	.09	.23	.11	.01	.06	1.00						
8. Network Size 2006	4.41	3.86	.08	.08	.32	.12	.04	.11	.78	1.00					
9. Network Knowledge Heterogeneity 05	.50	.31	-.01	.02	.13	-.04	.12	.15	.41	.36	1.00				
10. Network Knowledge Heterogeneity 06	.47	.32	-.05	-.02	.10	-.01	.09	.11	.30	.39	.55	1.00			
11. # of Weak Ties 2005	1.76	2.40	-.02	.02	.07	-.02	.01	.07	.48	.62	.32	.23	1.00		
12. # of Weak Ties 2006	1.41	2.17	-.08	-.02	.03	-.04	-.03	.01	.55	.48	.34	.23	.79	1.00	
13. Ratio of Weak Ties 2005	.28	.29	.02	.06	.00	-.02	.08	.08	.07	.13	.14	.05	.59	.41	1.00
14. Ratio of Weak Ties 2006	.21	.24	-.02	.00	-.01	-.06	-.01	.00	.19	.13	.22	.08	.47	.65	.67
15. # of Strong Ties 2005	3.76	3.10	.01	.11	.25	.17	.03	.09	.68	.68	.37	.41	.24	.31	-.25
16. # of Strong Ties 2006	4.16	3.33	.07	.13	.27	.18	.05	.12	.64	.77	.36	.42	.43	.23	-.07
17. Ratio of Strong Ties 2005	.65	.32	.03	.01	.05	.09	.00	.00	.16	.09	.16	.21	-.39	-.25	-.72
18. Ratio of Strong Ties 2006	.72	.30	.07	.09	.06	.15	.08	.09	.09	.13	.12	.20	-.22	-.40	-.39
19. Age	45.00	10.93	-.22	-.04	-.05	.00	.13	.03	.02	.06	.02	.03	.03	.06	-.09
20. Parent	.51	.50	.03	-.04	.11	.04	.05	.02	-.05	-.02	-.03	.11	-.04	-.01	.01
21. Growth Intentions	3.02	1.33	.11	-.03	.18	-.01	-.03	.07	.08	.05	.09	.03	.04	.05	-.03
22. Sell Firm Intentions	2.48	1.44	.07	.08	.22	.10	.30	.30	.17	.21	.14	.12	.06	.03	-.02

^a Zero-order correlations are reported.

n=174, values above .14 are significant at .05 and values above .19 are significant at .01, two-tailed test

values above .12 are significant at .05 and values above .17 are significant at .01, one-tailed test

<i>Variables</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>
14. Ratio of Weak Ties 2006	1.00								
15. # of Strong Ties 2005	-.10	1.00							
16. # of Strong Ties 2006	-.16	.91	1.00						
17. Ratio of Strong Ties 2005	-.44	.44	.29	1.00					
18. Ratio of Strong Ties 2006	-.63	.33	.39	.77	1.00				
19. Age	-.02	.01	.00	.03	-.04	1.00			
20. Parent	.02	-.04	-.05	-.04	-.03	-.05	1.00		
21. Growth Intentions	-.05	.08	.07	.05	.05	-.06	-.08	1.00	
22. Sell Firm Intentions	.01	.08	.11	.12	.11	.20	.00	.37	1.00

All variables were assessed to evaluate their conformity to the assumptions required for running OLS regression. In some instances (e.g., network size 2005, network size 2006, number of employees 2006, sales 2006, strong ties 2005, strong ties 2006, weak ties 2005, and weak ties 2006), results suggested that the data were slightly skewed. After evaluating the type of skewness, it was determined that the variables were positively skewed as the skewness values are all greater than zero (Mertler & Vannatta, 2002; Cohen, Cohen, West, & Aiken, 2003). Consequently, when data are positively skewed, an appropriate transformation is a log transformation and that will be used in these data (Mertler & Vannatta, 2002).

Additionally, since the log of a number equal to or less than zero is undefined (Cohen, et al., 2003), prior to transforming the variables that included zeros I added a constant to each score in order to bring the smallest value to at least 1. Each of the skewed variables contained zero as their lowest value. Therefore, a constant of one was added to each score of each variable to bring the smallest value up to one for each variable prior to applying the log transformation to these variables. I then used the natural log (ln) transformation function in SPSS. After transforming the variables, all variables became appropriately normally distributed. All analyses were run using the transformed and non-transformed derivations of the variables for comparison. The results were unchanged as a consequence of transforming the variables and so the non-transformed variables are included in the regression data reported here.

For the models testing moderators, to reduce multicollinearity and following the recommendations of Cohen, et al. (2003) the predictor variables were mean-centered. Further, variance inflation factor (VIF) scores were examined for the predictive variables and all were considerably below the 10.0 standard (Ryan, 1997). This suggests that multicollinearity did not present a biasing problem in the analyses. To plot significant interactions, values representing

plus or minus one standard deviation from the mean were used to generate the plotted regression lines to be discussed later (Cohen et al., 2003).

Entrepreneur expertise 2006. The models examining the comprehensiveness of the entrepreneurs' expertise in January 2006 as a dependent variable predicted that the comprehensiveness of the knowledge present in the entrepreneurs' networks in 2005 and the size of entrepreneurs' networks in 2005 (network knowledge heterogeneity) would be positively associated with the comprehensiveness of the business-related expertise held by the entrepreneur in 2006. As can be seen in Chapter 3 Table 4, the overall model is significant ($R^2 = .11$, $F = 3.26$, $p < .01$).

**Chapter 3 Table 4 Results of Multiple Regression Analysis for Hypothesized Relationships
Mass Mail Sample^a**

Variable	Entrepreneur Expertise 2006	Network Knowledge Heterogeneity 2006	Network Size 2006	# of Weak Ties 2006	# of Strong Ties 2006
<i>Controls</i>					
Age	-.04	-.00	.05	.04	-.03
Parent Entrepreneurs	.01	.12*	.02	-.00	-.04
Growth Intentions	-.06	-.01	-.05	.06	.02
Liquidity Event Intentions	.32***	.08	.09*	.01	.08
<i>Predictors</i>					
Network Knowledge Heterogeneity 2005	.13 [†]				
Network Size 2005	-.04	.24***	.62***		
# of Weak Ties 2005		.11 [†]	.32***		.42***
# of Days to 1 st Hire		-.04	.10**	-.08	
# of Days to 1 st Sale		-.03	-.01	-.01	
R ²	.11	.12	.70	.01	.19
Adjusted R ²	.07	.08	.69	-.02	.17
F	3.26**	2.89***	48.49***	.36	7.98***

^a N=174. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, [†] p < .10, one-tailed.

Hypothesis 2a predicted a positive relationship between the comprehensiveness of entrepreneurs' network knowledge (network knowledge heterogeneity) 2005 and entrepreneur expertise 2006. Hypothesis 2b predicted a positive relationship between the size of the entrepreneurs' network in 2005 and entrepreneur expertise 2006. The analyses suggest that network heterogeneity 2005 is positively and marginally significantly related to entrepreneur expertise 2006 ($\beta = .13, p < .10$), marginally supporting hypothesis 2a. Network size 2005, however, was not related to entrepreneur expertise 2006 ($\beta = -.04, p > .05$), not supporting hypothesis 2b. Close inspection of the correlation matrix and the beta values generated in the analyses suggests the potential for a suppressor effect (Cohen, et al., 2003) in this model with the variables network knowledge heterogeneity 2005 and network size 2005. I tested for this possibility by removing the suspect variables one at a time (Cohen, et al., 2003) and rerunning the analyses. The results remained the same, suggesting that they are robust.

Network knowledge heterogeneity 2006. The models examining network knowledge heterogeneity 2006 as a dependent variable predicted that the size of entrepreneurs' networks 2005 and the frequency of weak ties 2005 would be positively associated with the heterogeneity of the knowledge in entrepreneurs' networks 2006. Further, a negative relationship between the number of days to first sale and first hire and network heterogeneity 2006 was also predicted. As can be seen in Chapter 3 Table 4, the overall model is significant ($R^2 = .12, F = 2.89, p < .001$).

Hypothesis 4a-b predicted a positive relationship between the size of entrepreneurs' networks 2005 and network knowledge heterogeneity 2006. Hypothesis 4b-b predicted a positive relationship between the frequency of weak ties in entrepreneurs' networks 2005 and network knowledge heterogeneity 2006. The analyses suggest that network size 2005 is positively and significantly related to network knowledge heterogeneity 2006 ($\beta = .24, p < .001$), supporting

hypothesis 4a-b. The frequency of weak ties 2005, however, was only marginally related to network knowledge heterogeneity 2006 ($\beta = .11, p < .10$), marginally supporting hypothesis 4b-b.

Hypothesis 3a-b predicted a negative relationship between the number of days to first sale and the network knowledge heterogeneity 2006. Hypothesis 3b-b predicted a negative relationship between the number of days to first hire and network knowledge heterogeneity 2006. Before analyzing the data for these hypotheses, I reverse coded the variables for days to first hire and first sale. Thus, higher numbers and positive relationships would indicate support for the hypotheses. The analyses suggest that neither number of days to first sale ($\beta = -.04, p > .10$) or number of days to first hire ($\beta = -.03, p > .10$) are related to network knowledge heterogeneity 2006, not supporting hypotheses 3a-b and 3b-b.

Network size 2006. The models examining network size 2006 as a dependent variable predicted that the size of entrepreneurs' networks at 2005 and the frequency of weak ties 2005 would be positively associated with the network size 2006. Further, a negative relationship between the number of days to first sale and first hire and network size 2006 was also predicted. As can be seen in Chapter 3 Table 4, the overall model is significant ($R^2 = .70, F = 48.49, p < .001$).

Hypothesis 4a-a predicted a positive relationship between the size of entrepreneurs' networks 2005 and network size 2006. Hypothesis 4b-a predicted a positive relationship between the frequency of weak ties in entrepreneurs' networks 2005 and network size 2006. The analyses suggest that network size 2005 is positively and significantly related to network size 2006 ($\beta = .62, p < .001$), supporting hypothesis 4a-a. Analyses further suggest that the frequency of weak

ties 2005 was positively and significantly related to network size 2006 ($\beta = .32, p < .001$), supporting hypothesis 4b-a.

Hypothesis 3a-a predicted a negative relationship between the number of days to first sale and the network size 2006. Hypothesis 3b-a predicted a negative relationship between the number of days to first hire and network size 2006. Recall that I reverse coded the variables for days to first hire and first sale so higher numbers and positive relationships would indicate support for the hypotheses. The analyses suggest that number of days to first sale ($\beta = -.01, p > .10$) was not related to network size 2006, not supporting hypothesis 3a-a. Analyses do suggest that the number of days to first hire is significantly related to network size 2006 and in the predicted direction ($\beta = .10, p < .01$), supporting hypothesis 3b-a.

Further, to examine the peculiarity of the sign differences between the correlation coefficient for number of days to first sale and network size 2006 when compared to the beta coefficient, I again explored the possibility of a suppressor effect (Cohen, et al., 2003) and the results consistently remained the same.

Frequency of weak ties 2006. The models examining the frequency of weak ties 2006 as a dependent variable predicted a negative relationship between the days to first sale and the frequency of weak ties 2006 as well as a negative relationship between days to first hire and the frequency of weak ties 2006. The analyses suggest that the overall model was not significant ($R^2 = .01, F = .36, p > .05$). These results fail to support hypotheses 3a-c and 3b-c.

Frequency of strong ties 2006. The models examining the frequency of strong ties 2006 as a dependent variable predicted that the frequency of weak ties 2005 would be positively associated with the frequency of strong ties 2006. As can be seen in Chapter 3 Table 4, the overall model is significant ($R^2 = .19, F = 7.98, p < .001$), supporting hypothesis 4b-c.

Days to first commercial sale. Hypothesis 1a-a predicted that the size of entrepreneurs' networks 2005 would moderate the relationship between entrepreneurs' expertise 2005 and the number of days to reach first sale such that the larger the network 2005, the fewer the days to first sale²⁴. Hypothesis 1c-a predicted that the comprehensiveness of the knowledge in the entrepreneurs' networks 2005 (network heterogeneity) would moderate the relationship between entrepreneurs' knowledge sets 2005 and days to reach first sale such that the more comprehensive the knowledge in the network 2005, the few the days to first sale. The analyses suggest the overall model reported in Table 5 is not significant ($R^2 = .03$, $F = .57$, $p > .10$), not supporting hypotheses 1a-a or 1c-a.

I examined the analyses for the possibility of suppressor effects, removing the suspect variables one at a time (Cohen, et al., 2003) and rerunning the analyses. The only change in the model occurred when I removed the Network Size 2005 variables and interactions. This modification flipped sign for Entrepreneur Expertise 2005 (e.g., positive beta and positive correlation). However, the overall model was still not significant.

Days to first full-time employee hire. Hypothesis 1a-b predicted that the size of entrepreneurs' networks 2005 would moderate the relationship between the entrepreneurs' expertise 2005 and the number of days to reach first hire such that the larger the network 2005, the fewer the days to first hire²⁵. Hypothesis 1c-b predicted that the comprehensiveness of the knowledge in the entrepreneurs' networks 2005 (network heterogeneity) would moderate the relationship between entrepreneurs' knowledge sets 2005 and days to reach first hire such that the more comprehensive the knowledge in the network 2005, the few the days to first hire. The

²⁴ Recall I reverse coded the variable, so a positive and significant relationship would support this hypothesis.

²⁵ Recall I reverse coded the variable, so a positive and significant relationship would support this hypothesis.

analyses suggest the overall model is marginally significant ($R^2 = .08$, $F = 1.53$, $p < .10$).

However, the only significant relationship is with the control variable age ($\beta = -.24$, $p < .001$),

not supporting hypotheses 1a-b or 1c-b.

Chapter 3 Table 5 Results of Moderated Multiple Regression Analysis for Hypothesized Relationships Mass Mail Sample^a

Variable	# of Days to 1st Sale	# of Days to 1 st Hire
<i>Controls</i>		
Age	-.08	-.24***
Parent Entrepreneurs	-.06	.01
Growth Intentions	-.07	.07
Liquidity Event Intentions	.08	.08
<i>Predictors</i>		
Entrepreneur Expertise 2005	.06	.02
Network Size 2005	.09	-.02
Network Knowledge Heterogeneity 2005	-.03	-.01
<i>Moderators</i>		
Entrepreneur Expertise 2005 x Network Size 2005	.06	.09
Entrepreneur Expertise 2005 x Network Knowledge Heterogeneity 2005	.02	.04
R ²	.03	.08
Adjusted R ²	-.02	.03
<i>F</i>	.57	1.53 [†]
^a N=174. Standardized beta-coefficients are reported.		
*** p < .001, ** p < .01, * p < .05, † p < .10, one-tailed.		

Dollar sales January 2006. Hypothesis 1b-a predicted that the size of entrepreneurs' networks 2006 would moderate the relationship between the entrepreneurs' expertise 2006 and the first year dollar sales such that the larger the network, the higher the first year sales.

Hypothesis 1d-a predicted that the comprehensiveness of the knowledge in entrepreneurs'

networks 2006 (network knowledge heterogeneity) would moderate the relationship between entrepreneurs' knowledge sets 2006 and first year sales such that the more comprehensive the knowledge in the network 2006, the higher the first year sales. The analyses reported in Chapter 3 Table 6 suggest the overall model is not significant ($R^2 = .04$, $F = .75$, $p > .10$), not providing support for hypotheses 1b-a or 1d-a.

Chapter 3 Table 6 Results of Moderated Multiple Regression Analysis for Hypothesized Relationships Mass Mail Sample^a

Variable	Ln \$ Sales Jan 2006	# Employees Jan 2006
<i>Controls</i>		
Age	-.02	-.08
Parent Entrepreneurs	.05	.10 [†]
Growth Intentions	-.05	.13*
Liquidity Event Intentions	.09	.02
Network Size 2005	.05	.01
<i>Predictors</i>		
Entrepreneur Expertise 2006	.09	.21***
Network Size 2006	.09	.26***
Network Knowledge Heterogeneity 2006	-.08	-.06
<i>Moderators</i>		
Entrepreneur Expertise 2006 x Network Size 2006	-.06	.29***
Entrepreneur Expertise 2006 x Network Knowledge Heterogeneity 2006	.06	-.08
R ²	.04	.26
Adjusted R ²	-.01	.22
<i>F</i>	.75	5.67***

^a N=174. Standardized beta-coefficients are reported.
*** p < .001, ** p < .01, * p < .05, † p < .10, one-tailed.

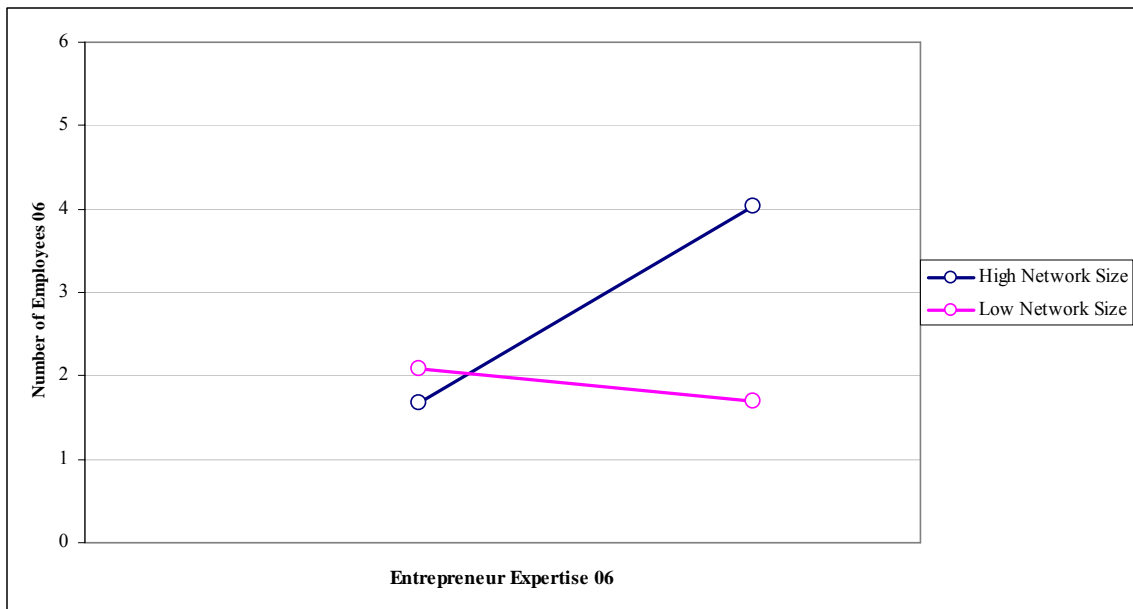
Number of employees January 2006. Hypothesis 1b-b predicted that the size of entrepreneurs' networks 2006 would moderate the relationship between the entrepreneurs' expertise 2006 and the first year number of employees such that the larger the network, the more employees 2006. Hypothesis 1d-b predicted that the comprehensiveness of the knowledge in entrepreneurs' networks 2006 (network heterogeneity) would moderate the relationship between entrepreneurs' knowledge sets 2006 and first year number of employees such that the more comprehensive the knowledge in the network 2006, the more employees 2006. The analyses reported in Chapter 3 Table 6 suggest the overall model is significant ($R^2 = .26$, $F = 5.67$, $p < .001$).

To examine the peculiarity of the sign differences between the correlation coefficient for number of employees 2006 and network knowledge heterogeneity 2006 when compared to the beta coefficient, I again explored the possibility of a suppressor effect (Cohen, et al., 2003) and the results consistently remained the same. Additionally, because theory suggests a predictive relationship between network size and network knowledge heterogeneity, the examination of the suppressor effect as well as controlling for network size 2005 in this model should have accounted for this relationship empirically. Due to the fact that the results remain regardless of changes to the model, this suggests that this finding is robust.

The data analyses indicated that although hypothesis 1b-b, examining the interaction of entrepreneur expertise 2006 and network knowledge heterogeneity 2006 ($\beta = -.08$, $p > .10$) was not supported, the moderating effect of network size 2006 on the relationship between entrepreneur expertise 2006 and number of employees 2006 positive and significant ($\beta = .29$, $p < .001$).

The interaction plot represented in Chapter 3 Figure 1 shows that the relationship between entrepreneur expertise 2006 and firm growth in terms of the number of employees 2006 is strengthened positively when network size is high such that as entrepreneur expertise increase, so does the size of the firm but only when network size is high.

This finding is further supported when testing the slopes of the regression lines to determine if they are statistically significant from zero. A test of the slopes reveals that the slope for high network size is statistically significant from zero ($t = 3.42, p < .001$) and the slope for low network size is marginally significant from zero ($t = -1.92, p < .056$). The overall results of these analyses suggest that hypothesis 1b-b was supported.



Chapter 3 Figure 1 Interaction of Entrepreneur Expertise 2006 and Network Size 2006 on Number of Employees 2006

Overall, the results of Study Two suggest that hypotheses 1a, 1c, and 1d were not supported and that hypothesis 1b was partially supported with the finding of a significant interaction between entrepreneur expertise 2006 and network size 2006 on the number of

employees 2006. Hypothesis 2a was marginally supported, suggesting that with a larger and thus more powerful sample size the relationship between the comprehensiveness of the knowledge present in entrepreneurs' networks in 2005 would be positively and strongly significantly related to the entrepreneurs' expertise in 2006. Hypotheses 2b and 3a, on the other hand were wholly not supported. Hypothesis 3b was partially supported, as indicated by the finding that the faster entrepreneurs hire their first employee the larger their network became 2006. Hypothesis 4a was wholly supported, suggesting that the size of entrepreneurs' networks 2005 was positively associated with the size of their networks 2006 and the comprehensiveness of the knowledge present in their networks 2006. Finally, hypothesis 4b was partially supported, as indicated by the positive and significant relationship between the frequency of weak ties 2005 and the size of the entrepreneurs' network 2006, the marginally significant relationship with the comprehensiveness of the knowledge present in the entrepreneurs' networks 2006, and the significant relationship with the frequency of strong ties 2006.

CHAPTER 4: DISCUSSION

Summary

The purpose of my dissertation was to develop and test a dynamic model of entrepreneurial networks as they change in the very early stages of venture development—venture emergence and early growth. First I developed a theoretical model that explains how, over time, entrepreneurs' networks interact with the knowledge characteristics of the entrepreneur to impact early-stage entrepreneurial outcomes. The model also explains the notion that over time entrepreneurs' networks will be dynamic, changing as a consequence of prior entrepreneurial outcomes and prior network linkages and it explains how entrepreneurs will learn as result of this process. Predictions developed from the model were tested in two studies. The first study utilized the Panel Study of Entrepreneurial Dynamics, an existing panel database containing information about nascent entrepreneurs, as its data source to test predictions examining the dynamics of entrepreneurs' networks across two time frames. The second study used a cross-sectional mass mail survey design to investigate all of the model's predictions on a random sample of newly incorporated firms in the state of Florida.

The results of the studies provided support for about one third of the predictions and there were a few contrasting findings across studies. Overall, the results of the studies suggest that some conceptualizations presented in the theoretical model should be reevaluated and that the applicability of some constructs when studying firms in the organizing stages of development (Weick, 1979) should be reconsidered. The remainder of this chapter focuses on a discussion of the results that emerged across both studies.

Findings

Chapter 4, Tables 1 and 2 graphically illustrate a summary of the findings from Studies One and Two. The green boxes indicate hypothesized relationships that were supported. The amber boxes indicate relationships that were either marginally supported or significant and in the opposite direction from that predicted, suggesting that these results should be interpreted with caution. Finally, the red boxes indicate hypothesized relationships that were not supported.

Within Phase Findings

The within phase hypotheses (H1a, H1b, H1c, and H1d) predicted that the relationship between the business-related expertise an entrepreneur possesses at one time period and the relative success with which that entrepreneur will develop their venture at a subsequent time period will be contingent on factors related to their networks of helpers. The network factors that I thought would enhance this relationship were the networks' size and the comprehensiveness of the business-related knowledge present in the entrepreneurs' networks.

The logic behind the idea that the size of entrepreneurs' networks would positively moderate this relationship was based on assertions held by the Knowledge-Based View (KBV) and economics that suggest that individuals are specialists with the knowledge that they possess based on their idiosyncratic experiences (Shan, et al., 1994; Yates, 2000). This work suggests that since larger networks should encompass more individuals and thus *more* knowledge, that larger networks might also then possess more knowledge that is relevant to the venture development process when compare to networks that are smaller. The results of Study Two provide mixed findings with regard to this expectation.

Chapter 4 Table 1 Summary Table of Results from Study Two (Mass Mail Sample)

<i>Predictor Variables</i>		Network Size 2005	Network Knowledge 2005	Days to 1 st Sale	Days to 1 st Hire	# Weak Ties 2005	Entrepreneur Expertise 2005 X Network Size 2005	Entrepreneur Expertise 2006 X Network Size 2006	Entrepreneur Expertise 2005 X Network Knowledge 2005	Entrepreneur Expertise 2006 X Network Knowledge 2006
<i>Dependent Variable</i>										
H1a	a. Days to first sale						<i>n.s.</i>			
	b. Days to first hire						<i>n.s.</i>			
H1b	a. First year sales							<i>n.s.</i>		
	b. First year size (# of employees)							<i>Supported</i>		
H1c	a. Days to first sale								<i>n.s.</i>	
	b. Days to first hire								<i>n.s.</i>	
H1d	a. First year sales									<i>n.s.</i>
	b. First year size (# of employees)									<i>n.s.</i>
H2a	Entrepreneur expertise 2006		<i>Marginally supported</i>							
H2b	Entrepreneur expertise 2006	<i>n.s.</i>								

<i>Predictor Variables</i>		Network Size 2005	Network Knowledge 2005	Days to 1 st Sale	Days to 1 st Hire	# Weak Ties 2005	Entrepreneur Expertise 2005 X Network Size 2005	Entrepreneur Expertise 2006 X Network Size 2006	Entrepreneur Expertise 2005 X Network Knowledge 2005	Entrepreneur Expertise 2006 X Network Knowledge 2006
<i>Dependent Variable</i>										
H3a	a. Network size 2006			<i>n.s.</i>						
	b. Network knowledge 2006			<i>n.s.</i>						
	c. # Weak ties 2006			<i>n.s.</i>						
H3b	a. Network size 2006				<i>Supported</i>					
	b. Network knowledge 2006				<i>n.s.</i>					
	c. # Weak ties 2006				<i>n.s.</i>					
H4a	a. Network size 2006	<i>Supported</i>								
	b. Network knowledge 2006	<i>Supported</i>								
H4b	a. Network size 2006					<i>Supported</i>				
	b. Network knowledge 2006					<i>Marginally Supported</i>				
	c. # Strong ties 2006					<i>Supported</i>				

**Chapter 4 Table 2 Summary Table of Results for Study One
(PSED Sample)**

<i>Predictor Variables</i>		Network Size t_1	# Weak Ties t_1
<i>Dependent Variable</i>			
H4a	a. Network size t_2	Supported	
	b. Network knowledge t_2	Supported	
H4b	a. Network size t_2		n.s.
	b. Network knowledge t_2		n.s.
	c. # Strong ties t_2		Significant, Opposite Sign

For Study Two (mass mail sample), hypothesis 1a tested that in 2005 the relationship between the business-related expertise held by the entrepreneur and the dependent variables of days to reach first sale and first hire would be moderated by the size of the entrepreneurs' networks in 2005 such that larger networks should lead to a quicker first sale and a quicker first hire. The results indicate that this hypothesis was not supported, possibly indicating that larger networks might not be beneficial to entrepreneurs who are interested in developing their firm quickly. Another explanation for these non-significant findings is that entrepreneurs may be unable to recognize the value and assimilate the resources gained from their large networks, a common problem often cited in discussions about absorptive capacity (Cohen & Levinthal, 1990).

Hypothesis 1b predicted that in 2006, the relationship between the business-related expertise held by the entrepreneur and the dependent variables of first year sales and first year venture size in terms of number of employees would be moderated by the size of the

entrepreneurs' networks in 2006 such that larger networks should lead to higher sales and larger firms. The results do not support this relationship with regard to sales, but the analyses do indicate a positive and significant moderating relationship for first year venture size. That is, as illustrated in Chapter 3 Figure 1, it seems that the relationship between entrepreneurs' expertise and firm growth is strengthened positively when network size is high such that as entrepreneur expertise increases, so does the size of the firm but only when network size is high. This finding is further supported by the test of the slopes of the regression lines that indicates that when network size is high, the slope of the line is significantly different from zero but that when network size is low, the slope is only marginally significantly different from zero ($p < .056$).

In trying to understand why a significant relationship might arise for firm growth and not for first year sales (an indicator generally used to evaluate firm performance in young firms) (Reynolds & Miller, 1993; Hansen & Bird, 1997; Gartner, et al., 2004), I conducted some sensitivity analyses (Cohen, et al, 2003) in hopes of identifying some explanation for the findings.

I considered that if a venture was founded by a solo, individual, founder as opposed a founding team that this might impact the results as team-based ventures might have a different network structure when compared to solo-based ventures. Consequently, I split the sample into a solo-founded venture sample and a team-founded venture sample and retested the hypotheses. After doing this, the results of the analyses examining first year sales remained the same for both samples—both overall models were not significant. However, when splitting the sample for the analyses examining first year venture size in terms of number of employees, the team-founded venture sample revealed a significant overall model ($R^2 = .35, F = 2.87, p < .01$) and the solo-founded venture samples revealed a non-significant overall model ($R^2 = .10, F = 1.32, p > .10$).

Further, for the team-founded venture sample, the interaction between entrepreneur expertise 2006 and network size 2006 was positive and significant ($\beta = .36, p < .05$)²⁶.

It appears that within this sample, team-founded ventures seem to benefit from having larger networks in terms of growing their ventures by the number of employees. This post hoc finding is not necessarily surprising as team-based ventures might be more open to larger employee rosters as they have already begun their operations as such. It could also be that solo-founded ventures are started that way for a reason—maybe these entrepreneurs want to be just that, entrepreneurs and not managers.

A complementary explanation lies within transaction cost economics (TCE) (Williamson, 1975; 1985) and the theory of the firm that views organizations as a nexus of contracts (Coase, 1937). Transaction costs refer to “the expenses involved in negotiating, implementing, and enforcing contracts” [Bluedorn, et al., 1994: 228]. In Williamson’s (1975; 1985) original development of TCE, he explains that economic efficiencies can be achieved to reduce these transaction costs through two different modes of organizing: markets or hierarchies. Hierarchies are what we think of as traditional firms where firms are a nexus of contracts (Coase, 1937). Organizing via markets explains how, temporarily, partners or contractors are paired for the purpose of (often) just a single exchange. According to Williamson (1975) firms exist because of their superior abilities to lessen human opportunism via hierarchical controls that are not accessible to markets. In terms of entrepreneurship, we think of entrepreneurs as being those individuals who are interested in organizing firms—hierarchies. It could be that the solo-founded venture sample is more representative of individual *contractors* who are interested in

²⁶ For comprehensiveness sake and for sensitivity analysis purposes, I also split the sample and examined the hypothesis 1a and the results were unchanged (e.g., the overall models were not significant).

organizing via markets. If this is true, then this presents another potential boundary condition or contingency of entrepreneurial cases to which my model will apply. This presents one area for future research.

In all, although this post hoc examination might help to explain the boundaries when network size moderates the relationship between entrepreneur expertise and venture growth in employees, it does not explain why no relationship was found when examining the sales variables. It could be that the size of entrepreneurs' networks is simply not related in an interactive way to the performance of new ventures in terms of sales.

Hypothesis 1c predicted that in 2005, the relationship between the business-related expertise held by the entrepreneur and the dependent variables of days to reach first sale and first hire would be moderated by the network knowledge heterogeneity of the entrepreneurs' networks in 2005 such that larger networks should lead to a quicker first sale and a quicker first hire.

The results of the analyses do not support hypothesis 1c, suggesting that the relative heterogeneity of the knowledge present within entrepreneurs' networks does not interact with the knowledge of the entrepreneur to influence venture development outcomes. That is, at higher levels of network knowledge heterogeneity, the relationship between entrepreneur expertise and days to reach first sale and days to first hire was not enhanced. A number of explanations could explain this non-significant finding. First, the comprehensiveness of the knowledge in the network might not be an appropriate variable to consider when examining the speed with which early-stage venture outcomes are reached. Again returning to the notion of absorptive capacity (Cohen & Levinthal, 1990) that suggests that within firms managers are constrained by their current knowledge and abilities such that it can be difficult for them to determine the value of the

resources coming from external sources and therefore it can be difficult to utilize the resources coming from those external sources. Maybe the entrepreneurs in the sample were limited in their ability to use external knowledge resources and apply that knowledge to executing venture development outcomes.

Alternatively, it could be that the speed of reaching venture development outcomes is not an effective outcome variable or benchmark to study when 1) trying to understand the impact of knowledge resources on venture development, and/or 2) studying early stage venture development outcomes in general. Perhaps future work should consider other, potentially more valid, benchmark indicators that might signal successful venture development in future studies. For example, during these early stages of venture development, firms are really interested in organizing (Ford & Sullivan, forthcoming) and so more appropriate outcomes of the organizing process might be those such as business plan completion, venture team recruitment, and venture capital or bank financing attainment, etc. These types of outcomes are more tangible outcomes of the venture organizing *process*. Then, the outcomes of the process include those such as first sale and first hire. It might be that in venture emergence and early growth stages of development, understanding the relationship between process outcomes relative to network dynamics might be more appropriate. So, another area for future research could entail refining the model that I developed here to include a more process-oriented focus.

A final explanation for this finding might deal with the characteristics of the sample for Study Two (mass mail sample). When examining the primary industries represented by the firms in the sample, it appears that the types of firms under study might not require a completely comprehensive group of business related knowledge types in order to develop successfully. Specifically, of the 174 firms represented, many were in industries where one could imagine that

a limited or more focused amount of business knowledge might be all that is necessary. Within the sample, 24 firms participated in the construction industry, possibly suggesting a specialized knowledge the type of construction or sub-contracting area of specialization might be all that is required. Thirty-eight firms participated in a variety of service-related industry such as janitorial, security, and lawn maintenance. One could imagine that these firms need only their specialized service-related knowledge coupled with a few other knowledge areas like sales and accounting. In these cases, the founders could possess all of these knowledge types themselves. Twenty-five firms fell within the real estate industry, another industry that might only require a few specialized knowledge types for success such as legal, finance, and sales. Finally, 18 firms were within the retail industry, possibly suggesting that the founders of these firms only needed comprehensive knowledge about a few functional areas like sales and marketing.

Hypothesis 1d predicted that in 2006, the relationship between the business-related expertise held by the entrepreneur and the dependent variables of first year sales and first year venture size in terms of employees would be moderated by the network knowledge heterogeneity of the entrepreneurs' networks in 2006 such that larger networks should lead to higher sales and larger firms.

The results for hypothesis 1d suggest that this hypothesis was not supported. That is, at higher levels of network knowledge heterogeneity, the relationship between entrepreneur expertise and first year sales and venture size was not enhanced. The potential logic in explaining the results of this finding follows from consideration of hypothesis 1c. It could be that due to constraints posed by founders' absorptive capacities, the characteristics of the venture organizing process, and the types of business and industries represented in the sample, that the

comprehensiveness of business-related knowledge might not be related to the relationships under study.

Summary discussion of within-phase findings. After considering the overall pattern of results that emerged from the within-phase hypotheses, I am left wondering about one overarching issue. Why is it that in no case did the knowledge in the entrepreneurs' network, as measured (network knowledge heterogeneity), impact the relative achievement of venture development outcomes? I believe that the answer to this question may be found in the relationship between the construct of network size and the construct network knowledge. Specifically, the logic behind the relationship between network size, entrepreneur expertise, and venture development outcomes inherently involved the concept of knowledge—the quantity of knowledge.

Based on the KBV and work in economics (Collinson & Gregson, 2003; Yates, 2000; Shan, et al., 1994; Kogut & Zander, 1992; Itami & Roehl, 1987), I reasoned that network size would impact the relationships hypothesized because larger networks should lead to *more* knowledge within the network, although this notion did nothing to establish a boundary of the *quality* of the knowledge in the network, which is where the network knowledge heterogeneity construct came into play. In fact, I specifically state “In addition to the expectation that *the size of the network, as a proxy for the amount of knowledge available to the entrepreneur from external contacts* [emphasis added], will moderate the relationship between entrepreneur knowledge sets and venture development outcomes, I believe...” I believe that this idea is true—network size is related to network knowledge and an examination of the correlation matrix in Chapter 3 Table 3 shows correlations between network size and network knowledge heterogeneity all positive and significant at $p < .01$, further supporting this notion. Additionally,

in trying to address the potential suppressor effect that this relationship might have when empirically examining hypotheses 1b and 1c, I accounted for this relationship.

All of this has left me to reconsider the potential for a construct of knowledge in terms of its impact for early stage new venture development. Based on the results of Study Two (mass mail sample), I believe that the construct of network size is capturing the notion of knowledge within the network—the *amount, quantity, or depth* of knowledge and that is what seems to be more important when examining the relationships hypothesized across the model that I have developed in this dissertation²⁷. The construct of knowledge heterogeneity as studied here was initially intended to capture the *comprehensiveness, quality, or breadth* of the knowledge within early-stage nascent entrepreneurs' networks. Perhaps, for early stage entrepreneurs or at least for those that were studied here quality is not the issue. Or maybe, even if quality was an important issue, the entrepreneurs under study did not know how to evaluate the quality of the knowledge present (Cohen & Levinthal, 1990).

Of the 174 firms included in the sample, 106 had never previously started a firm, 26 had started one firm previously, 22 had started two firms, and 20 entrepreneurs had started more than two firms. Due to the fact that most of the entrepreneurs in the sample had little or no experience in starting a firm previously, it is possible that they did not know how to evaluate or use the diverse knowledge present in their network.

A final consideration is that although new entrepreneurs may have a diverse network in terms of the representativeness of the business knowledge in the network, the actual quality of that knowledge might not be high. In early stages of venture development, especially for new entrepreneurs, maybe a larger network would house the potential for a number of say

²⁷ I will return to this point again as I discuss the results of the between-phase hypotheses.

accountants, one of whom actually is of high quality in terms of their help in the new venture development process. This type of explanation might also help explain why in later stages of venture development constructs such as network efficiency (Baum, et al., 2000) are positively related to venture development outcomes as opposed to earlier-stage outcomes. Further, this might explain the inverted-U relationship Deeds and Hill (1996) reported for network size in mid-stage venture development outcomes. It could be that in very early stage ventures, like those studied here, larger networks are helpful in growing the venture. Then over time entrepreneurs “weed through” their network, refining it to include a parsimonious and quality set of network partners relevant to their pursuits.

Finally, a retrospective look at the constructs included in the model, suggests that an alternative and potentially more fruitful way of looking at the dynamics of early venture development and entrepreneurs’ networks might be through a process lens. That is, during early stages of venture development like those studied here, firms are really interested in organizing (Ford & Sullivan, forthcoming; Weick, 1979) their venture. Consequently, entrepreneurial outcomes associated with the organizing process like business plan completion, venture/management team recruitment, and venture capital or bank financing attainment might be more appropriate.

Between Phase Findings

The between phase hypotheses (H2a, H2b, H3a, H3b, H4a, and H4b) predicted a number of relationships whereby entrepreneurs’ networks evolve over time and the entrepreneur learns as a consequence of interacting with their network partners over time.

Hypotheses 2a and 2b. For hypotheses 2a and 2b, I examined the idea that the entrepreneur learns over time through interacting with their networks. First, I argued that more

knowledgeably comprehensive networks at one point in time would be positively associated with the comprehensiveness of the business-relevant knowledge that the entrepreneur possesses in a subsequent point in time (H2a). Then, I argued that larger networks at one point in time would be positively associated with the comprehensiveness of the business-relevant knowledge that the entrepreneur possesses in a subsequent point in time (H2b).

The results of H2a suggest a marginally significant relationship between the comprehensiveness of the business-related knowledge in the network 2005 and the comprehensiveness of the knowledge possessed by the entrepreneur 2006. Although our confidence with this finding is marginal ($p < .10$), I expect that this relationship would have reached stronger levels of significance if I had a larger sample and thus more power (Cohen, et al., 2003). Regardless, it seems that over time, an entrepreneur might be able to increase the breadth of the business-related knowledge that they have as a result of interacting with a network that has a large scope/breadth of knowledge.

Another interesting relationship that emerged when examining this hypothesis was the strongly significant ($p < .001$) relationship between the liquidity intentions of the entrepreneur and the business expertise of the entrepreneur in 2006. That is, participants were asked to indicate, on a scale of 1 to 5 the extent to which they agreed that their intentions for starting the firm was to sell it at a later date and achieve a liquidity event. The strength and direction of this relationship is not necessarily surprising when one considers the idea that it is possible that entrepreneurs with more expertise are potentially involved in starting more knowledge intensive firms. These knowledge intensive firms potentially involve the entrepreneur making more and/or better connections between disparate types of knowledge (Shane, 2000). As a result,

other, sometimes larger firms can more effectively and easily obtain the skills possessed by the knowledge intensive firm by acquiring them as opposed to developing the skills internally.

The non-significant relationship found for H2b is not surprising, in retrospect. If entrepreneurs (especially new or very early stage entrepreneurs) are constrained in their ability to sort through and use the knowledge present in their network (Cohen & Levinthal, 1990) and if larger networks house a large scale of knowledge, then it is not surprising that larger networks in 2005 were not positively associated with the expertise of the entrepreneur 2006. As mentioned earlier, it could be that entrepreneurs 1) do not know *how* to use the knowledge in their networks, 2) do not *need* to use the knowledge in their networks, and/or 3) *cannot sort* through the knowledge in their networks to determine what knowledge is valuable and what is not. All of these factors could provide an explanation for the non-significant relationship between these variables.

Hypotheses 3a and 3b. Hypotheses 3a and 3b look at the impact of reaching benchmark outcomes indicative of successful venture development on expanding the network of the entrepreneur to include a network with specific characteristics. The two benchmarks examined were the number of days that it took from the date of committing to pursuing the venture to the first commercial sale (H3a-a, b, c) and to the first full-time employee hire beyond the founder(s) (H3b-a, b, c). The network characteristics that were examined were network size 2006, network knowledge heterogeneity 2006, and the number of weak ties 2006.

None of the expected relationships for H3a were supported, suggesting that how fast an entrepreneur is able to achieve a *first* sale is not important for expanding their network. In considering this result it is not necessarily surprising as a first sale is not a particularly visible outcome to those in the external environment when compared to an event such as an initial

public offering. Also, since based on the industry descriptions provided by the founders many of the firms in the sample seemed to provide products and services on a small scale (e.g., locally or regionally) and therefore a single or first sale might not be a particularly salient event in the life cycle of these firms. Moreover, if these early stages of venture development are truly about organizing resources toward the development of a firm, then outcomes such as the development of a business plan might have been more a more appropriate benchmark to examine relative to the characteristics to the entrepreneurs' networks (Ford & Sullivan, Forthcoming).

The analyses of H3b found support for H3b-a, but not H3b-b or H3b-c. That is, for H3b-a, the faster that an entrepreneur hired a first full-time employee beyond the founder(s), the larger their network was in the subsequent time period. However, for network knowledge 2006 (H3b-b) and the number of weak ties 2006 (H3b-c), no relationship was found.

For the supported relationship (H3b-a), if my theory is correct, then reaching this benchmark outcome of a successfully developing venture might have signaled to people in the external environment that this firm was doing well and so they were attracted to join the entrepreneurs' network. Another explanation could be that since these firms hired at least one employee, that the respondents then included these hires as a part of their network in the name generator portion of the survey, thus inherently increasing the size of their network. Although I have no way of accounting for this possibility directly, it is not an explanation that I can completely rule out and it is one that must be controlled for in future work.

For the non-significant relationships (H3b-b and H3b-c), like my explanation of the findings for H3a, it is possible that first hire is not a particularly visible outcome to those in the external environment when compared to an event such as an initial public offering. And although network size may increase as a consequence of achieving a quicker first hire and the

overall depth of knowledge might increase (H3b-a), the breadth (H3b-b) of the knowledge is not necessarily impacted. This explanation goes hand-in-hand with not finding a relationship between days to first hire and the number of weak ties 2006 because weak ties are thought to lead to new/diverse knowledge (Burt, 1982). So, if the diversity of the knowledge is not impacted by a faster first hire (H3b-b), there is not necessarily a reason to expect a relationship with weak ties 2006 (H3b-c).

Hypotheses 4a and 4b. Hypotheses 4a and 4b look at the idea that having a network with certain structural characteristics at one time period should lead to a network with a different structure and content composition in a subsequent time period. These hypotheses were tested in both studies described in Chapter Three. Study One utilized the PSED database as its data source and Study Two used the data from a primary data collection utilizing a cross sectional mass mail survey design effort undertaken by me.

Hypothesis H4a examined the impact of network size at one time period on network size (H4a-a) and network knowledge heterogeneity (H4a-b) at a subsequent time period. These relationships were fully supported across both studies, providing substantial confidence in the findings reported here. That is, within this dissertation and across the two studies undertaken it seems that the size of entrepreneurs' networks in one time period is positively associated with the size of their networks in later time periods (H4a-a). This finding is not necessarily surprising and it suggests one way for entrepreneurs to expand the size of their networks over time. Although not surprising, this is an important finding as the results from H1b suggest that a larger network can enhance the relationship between entrepreneur expertise and venture growth in employees, so understanding ways that entrepreneurs can expand their network size is important.

These results also suggest that the size of entrepreneurs' networks at one time period are positively related to the comprehensiveness of the business-related knowledge present in the entrepreneurs' networks at a subsequent time period (H4a-b). The finding suggests that one way for entrepreneurs to expand the relative diversity of the business-related knowledge within their networks over time is to garner a larger network. This supports assertions from the knowledge-based view (Kogut & Zander, 1992). The practical importance of this finding is, however, questionable as the results of Study Two (mass mail sample) analyses that examined the venture development outcomes associated with a diverse knowledge network were not supported. This idea will be discussed further in the overall discussion section of this chapter.

Hypothesis 4b examined the impact of the number of weak ties at one time period on the network size, network knowledge heterogeneity, and the number of strong ties in the subsequent time period. Interestingly, the results across the studies are conflicting. That is, for Study One (PSED), no relationship was found between the number of weak ties t_1 and network size t_2 (H4b-a) or the number of weak ties t_1 and network knowledge heterogeneity t_2 (H4b-b). Further, the relationship between the number of weak ties t_1 and the number of strong ties t_2 was significant but in the opposite direction than expected (a negative relationship) (H4b-c). Conversely, Study Two (mass mail sample) found support for the relationship between the number of weak ties 2005 and network size 2006 (H4b-a) and the number of strong ties 2006 (H4b-c). Further, for Study Two marginal support was found for the relationship between the number of weak ties 2005 and network knowledge heterogeneity 2006.

Initially, when considering the implications of the results of H4b-c for Study One (PSED) I thought that this relationship could be problematic because if weak ties lessen the likelihood of forming *new* strong ties over time and if strong ties are associated with trust and depth of

information sharing (Gulati, et al., 2002), then the entrepreneur could be missing out on valuable information and trustworthy helpers as a result of having many weak ties. Upon further consideration, I thought that perhaps additional empirical examinations were needed to refine the idea of the impact of the sheer *number* of weak and strong ties over time. Specifically, I wondered²⁸ that perhaps a more effective way of looking at this relationship was that it was not the number of weak and strong tie partners that matters, but rather the relative ratio of weak ties to total ties and strong ties to total ties. Further prompting this inquiry were the conflicting findings between Studies One and Two.

In an effort to address this issue, I created two new variables for weak and strong ties over each time period and for each study's sample and the results were the same for both studies—a significant and negative relationship for Study One ($\beta = -.89, p < .001$) and for Study Two ($\beta = -.39, p < .001$). The results of these analyses, along with some others to be discussed shortly, are presented in Chapter 4 Tables 3 and 4.

It seems that as the relative number of weak ties to total ties at one time period goes up, relative number of strong ties in the subsequent time period goes down or as the relative number of weak ties to total ties at one time periods goes down, the relative number of strong ties to total ties in the next time period goes up. If that is true, then this situation could explain how over time all ties could become all weak ties or all strong ties. My logic is based on the following thought experiment:

Weak ties are denoted as WT, strong ties are denoted ST, and total ties are denoted TT and time is denoted by a subscript number corresponding to each subsequent time period. *Ceteris paribus*, if $WT/TT + ST/TT = TT/TT$ and if an increase in WT_1/TT_1 leads to a decrease in ST_2/TT_2 , then

²⁸ I would like to thank my committee members for this insightful suggestion.

since $WT_2/TT_2 + ST_2/TT_2 = TT_2/TT_2$, in time 2, WW_2/TT_2 should go up. Then, since WW_2/TT_2 went up, that means that in time 3, ST_3/TT_3 goes down and so on. Alternatively, when WT_1/TT_1 goes down, then in time 2 ST_2/TT_2 goes up and since $WT/TT + ST/TT = TT/TT$, then in time 2, WW_2/TT_2 should go down, which subsequently means that in time 3 ST_3/TT_3 goes up, and so on.

Chapter 4 Table 3 Results of Multiple Regression Analysis for Hypothesized Relationships with Different Tie Strength Measures Mass Mail Sample—Strong Ties 2006 DV^a

Variable	# of Strong Ties 2006 Model a	Ratio of Strong Ties 2006 Model b	Frequency of Strong Ties 2006 Model c	Duration of Strong Ties 2006 Model d	Closeness of Strong Ties 2006 Model e
<i>Controls</i>					
Age	-.03	-.10	.01	-.00	.21
Parent Entrepreneurs	-.04	-.04	.05	.04	-.73
Growth Intentions	.02	-.01*	.04	.05	.91
Liquidity Event Intentions	.08	.13 [†]	.06	.05	-.39
<i>Predictors</i>					
# of Weak Ties 2005	.42***				
Ratio of Weak Ties 2005		-.39***			
# Weak Ties 2005 (Frequency)			.24***		
# Weak Ties 2005 (Duration)				.15	
# Weak Ties 2005 (Closeness)					.41***
R ²	.19	.17	.07	.03	.17
Adjusted R ²	.17	.15	.04	.00	.15
F	7.98***	6.87***	2.51*	1.12	6.97***

^a N=174. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, [†] p < .10, one-tailed.

Theoretically, the relationship whereby all ties become weak ties over time is not supported. On the other hand, several works would support the notion that *ceteris paribus* over time, through interaction and barring the relationship ceasing, ties tend to take on a more

socioemotional and trustworthy character, thus becoming strong ties (Hite, 2005; Perry-Smith & Shalley 2003; Hite & Hesterly, 2001). Thus, over time the relative ratio of weak ties to total ties is likely to decrease and the relative ratio of strong ties to total ties is likely to increase. A graphical illustration, presented in Chapter 4 Figure 1, of the results found here support this notion.

Chapter 4 Table 4 Results of Multiple Regression Analysis for Hypothesized Relationships with Different Tie Strength Measures PSED Sample^a

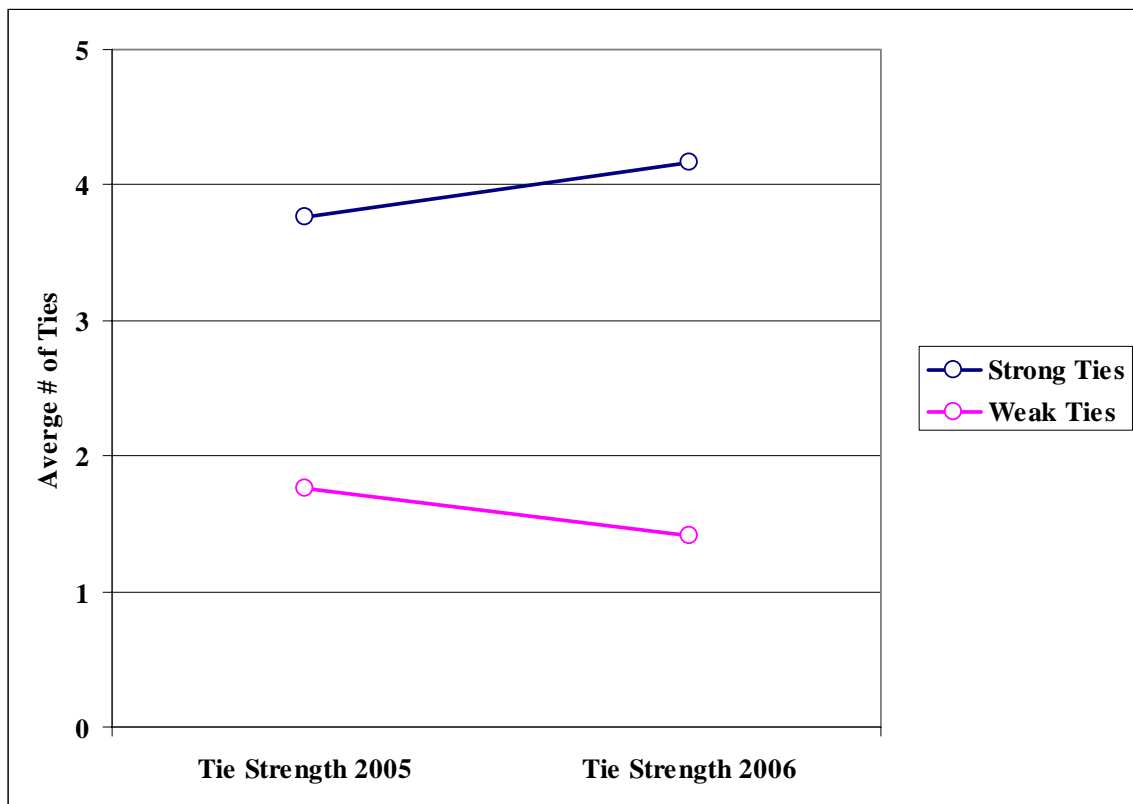
Variable	Network Knowledge Heterogeneity t_2	Network Size t_2	Ratio of Strong Ties t_2
<i>Controls</i>			
Age	.15	-.05	-.08
Parent Entrepreneurs	.09	-.09	-.03
<i>Predictors</i>			
Network Size t_1	.30**	.46**	
Ratio of Weak Ties t_1	-.13	-.10	-.89***
R^2	.17	.21	.82
Adjusted R^2	.11	.15	.81
F	2.82**	3.59**	77.06***

^a N=59. Standardized beta-coefficients are reported.
 *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$, one-tailed.

Although the idea that *all* ties will become strong ties come does not really seem practically plausible, it could act as a cautionary and logical note when prescribing advice to entrepreneurs—perhaps it would be advisable to maintain a relative balance of strong tie partners and weak tie partners so as to gain the full advantage of both types.

Further, examination of Chapter 4 Tables 3 and 4 of the relationship between the ratio of weak ties at one time period and network size at a subsequent time period finds yet another

difference across studies. First, the signs of the beta coefficients across studies vary. Study One (PSED) analyses reveal a negative and non-significant beta ($\beta = -.10, p > .10$). On the other hand, Study Two (mass mail sample) analyses reveal a positive and significant relationship between the ratio of weak ties to total ties 2005 and network size 2006 ($\beta = .08, p < .05$). Thus the conundrum across studies is still, at least somewhat, present.



Chapter 4 Figure 1 Average Number of Ties from 2005 to 2006 Study Two (Mass Mail Sample)

Another explanation for these curious findings deals with the manner in which the studies measure weak and strong ties, as well as how the tie strength and network data were collected in general. Study One (PSED) tie strength data was collected from each participant for only five

members of their network at each wave of data collection. Specifically, during the first data collection participants were asked to identify their five most important helpers and then to classify the nature of those relationships across a number of characteristics including tie strength. In subsequent waves of data collection, participants were not asked to reevaluate the nature of their relationship with the initial five helpers and only to add to the list if they obtained additional helpers (if there were any beyond those reported in the initial survey) up to a maximum of five new helpers. They then classified the nature of the newly reported relationships on a number of characteristics to include tie strength.

In Study Two (mass mail sample), however, I was not so restrictive on the number of partners (20 spaces were allotted on the name generator portion of the survey) about whom the participants could report. I additionally asked that they reevaluate the nature of the relationships of those network partners that remained in their network from 2005 to 2006 on a number of characteristics, to include the strength of the ties. Consequently, it could be that the Study One, PSED, data are somehow biased in terms of tie strength. That potential lessens the confidence that I have in Study One's findings regarding the dynamics of the entrepreneurs' networks in terms of tie strength.

Additionally, for Study Two I not only collected the network tie data as described in the previous paragraph, but I also collected tie strength data utilizing all measures used across the literature for assessing tie strength. That is, I measured the count of strong and weak ties by classifying them as either a) acquaintances (weak) or family and friends (strong) (Greve & Salaff, 2003; Leung, 2003; McDonald & Westphal, 2003), b) I assessed the idea of a ratio of weak to strong ties, and I measured tie strength by examining c) frequency of interaction (Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004), d) the duration of the relationship

(Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004), and e) the closeness of the relationship (Perry-Smith, 2006; Smith, et al., 2005; Burt, 2000, 2001, 2004), all across the different time frames of interest. Chapter 4 Tables 3, 5, 6, and 7 provide a comparison of the results from Study Two (mass mail sample) of all hypotheses that include the strong or weak tie constructs.

Chapter 4 Table 5 Results of Multiple Regression Analysis for Hypothesized Relationships with Different Tie Strength Measures of Mass Mail Sample—Network Size 2006 DV^a

Variable	Network Size 2006 Model a	Network Size 2006 Model b	Network Size 2006 Model c	Network Size 2006 Model d	Network Size 2006 Model e
<i>Controls</i>					
Age	.05	.06	.03	.03	.03
Parent Entrepreneurs	.02	.02	.01	.04	.00
Growth Intentions	-.05	-.05	-.06	-.04	-.06
Liquidity Event Intentions	.09*	.07 [†]	.09*	.10*	.08*
<i>Predictors</i>					
Network Size 2005	.62***	.77***	.62***	.55***	.62***
# of Weak Ties 2005	.32***				
Ratio of Weak Ties 2005		.08*			
# Weak Ties 2005 (Frequency)			.27**		
# Weak Ties 2005 (Duration)				.38***	
# Weak Ties 2005 (Closeness)					.27***
# of Days to 1 st Hire	.10**	.10*	.11**	.06 [†]	.09*
# of Days to 1 st Sale	-.01	-.02	-.03	-.04	-.01
R ²	.70	.63	.67	.72	.68
Adjusted R ²	.69	.61	.65	.71	.66
F	48.49***	35.04***	41.87***	52.81***	42.79***

^a N=174. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, [†] p < .10, one-tailed.

Chapter 4 Table 6 Results of Multiple Regression Analysis for Hypothesized Relationships with Different Tie Strength Measures Mass Mail Sample—Network Knowledge Heterogeneity 2006 DV^a

Variable	Network Knowledge Heterogeneity 2006 Model a	Network Knowledge Heterogeneity 2006 Model b	Network Knowledge Heterogeneity 2006 Model c	Network Knowledge Heterogeneity 2006 Model d	Network Knowledge Heterogeneity 2006 Model e
<i>Controls</i>					
Age	-.00	.01	-.00	-.00	.00
Parent Entrepreneurs	.12*	.12*	.12 [†]	.13*	.13*
Growth Intentions	-.01	-.01	-.01	-.01	-.01
Liquidity Event Intentions	.08	.07	.08	.08	.07
<i>Predictors</i>					
Network Size 2005	.24***	.29***	.27***	.26***	.32***
# of Weak Ties 2005	.11 [†]				
Ratio of Weak Ties 2005		.04			
# Weak Ties 2005 (Frequency)			.05		
# Weak Ties 2005 (Duration)				.06	
# Weak Ties 2005 (Closeness)					-.03
# of Days to 1 st Hire	-.04	-.05	-.04	-.05	
# of Days to 1 st Sale	-.03	-.04	-.04	-.03	
R ²	.12	.12	.12	.12	.11
Adjusted R ²	.08	.07	.07	.07	.07
F	2.89***	2.68**	2.82**	2.69**	2.66**

^a N=174. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, [†] p < .10, one-tailed.

Chapter 4 Table 7 Results of Multiple Regression Analysis for Hypothesized Relationships with Different Tie Strength Measures Mass Mail Sample—Weak Ties 2006 DV^a

Variable	# of Weak Ties 2006 Model a	Ratio of Weak Ties 2006 Model b	Frequency of Weak Ties 2006 Model c	Duration of Weak Ties 2006 Model d	Closeness of Weak Ties 2006 Model e
<i>Controls</i>					
Age	.04	-.04	.10	.06	.05
Parent Entrepreneurs	-.00	.01	-.01	-.09	.01
Growth Intentions	.06	-.06	.02	-.01	-.02
Liquidity Event Intentions	.01	.04	.01	.04	.05
<i>Predictors</i>					
# of Days to 1 st Hire	-.08	-.03	-.08	.09	.01
# of Days to 1 st Sale	-.01	-.00	.09	.01	.04
R ²	.01	.01	.03	.02	.01
Adjusted R ²	-.02	-.03	-.01	-.01	-.03
F	.36	.14	.74	.61	.20

^a N=174. Standardized beta-coefficients are reported.

*** p < .001, ** p < .01, * p < .05, † p < .10, one-tailed.

The results in Tables 3 through 7 report the results of a post hoc analysis examining all measures of tie strength on the respective dependent variables included in the study. Model a corresponds to the count measure of tie strength where ties are classified as either acquaintances or friends/family. Model b reports the results for the ratio measure of tie strength. Model c corresponds to frequency, model d to duration, and model e to closeness measures of tie strength.

The results across models are strikingly consistent, with exception of Model d in Table 3 that examines the relationship between weak ties 2005 and strong ties 2006 using the duration measure of tie strength. The overall consistency of these results coupled with the rigor involved with the measurement of the construct tie strength and the methods used to collect the network

data in general in Study Two (mass mail sample) leads me to have more confidence in the findings reported for Study Two with regard to tie strength variables when compared to Study One.

Overall Discussion and Future Directions

When synthesizing the overall findings from my dissertation I believe that we have learned many things. First, with regard to examining the benchmarks of success for very early stage ventures relative to their network and knowledge characteristics, the speed with which certain outcomes are achieved is not necessarily 1) impacted by network and knowledge factors and 2) does not seem to provide adequate cues to network partners as to the successful development of the venture. Future research should be informed as to this and try to identify other variables that might be more relevant when examining these types of relationships. Specifically, I believe that a logical and worthwhile modification to the model would involve reconceptualizing the model as a process model of new venture organization and dynamic networks. Although the overarching logic behind how and why the relationships hold should stay the same, benchmarks such as business plan articulation and management team assembly are likely to be more appropriate for understanding how and why early-stage venture networks evolve over time and how the changes in these networks impact the development of the venture.

Second, with regard to the impact of business-related knowledge and network characteristics on new venture performance and growth it seems as though performance in terms of sales is not impacted by these factors and that growth in terms of number of employees is. However, post hoc analyses suggested that these significant relationships might only hold for ventures of certain characteristics, like team-founded ventures. Thus a potential contingency of

some of the relationships proposed in my model might be that they apply to team-founded versus solo-founded firms. This issue also raises the concern that other boundary conditions might apply when examining my model's assertions. For example, perhaps the model would be more applicable when studying entrepreneurs in more knowledge intensive industries and/or those that intend to pursue venture organization via traditional hierarchies (Williamson, 1975) as opposed to acting as a contractor organizing via markets and this is an area for future work.

A third point that seemed to emerge across many of my theoretical arguments as well as my empirical assessments was the relationship between network size and network knowledge heterogeneity and the relationship between network size and network knowledge in general. The more that I thoughtfully examine both the theory and the empirical results of the predictions including these constructs, the more convinced that I become that network size is capturing the notion of the *scale* or *depth* of knowledge present within the network. And as expected, network knowledge heterogeneity is capturing the *scope* or *breadth* of the knowledge in the network. Ultimately, then, after contemplating the results of this study I believe that these constructs have different implications for early-stage ventures when compared to later-stage ventures. This point is particularly interesting when one considers the results of this dissertation relative to those reported by prominent researchers such as Baum, et al. (2000), Deeds and Hill (1996), Hansen and Bird (1997), and Reynolds and Miller (1992). Whether they intended to or not, the work from these researchers seems to suggest that smaller and more knowledgeably efficient networks are important for later in the venture development process. The work from this dissertation suggests that early in a venture's life cycle larger networks with more depth of knowledge are important and the quality or breadth of knowledge in the network might not matter, at least in terms of the entrepreneurial and network outcomes examined here. This issue is one that I would

like to explore further in subsequent data collection follow-ups of the Study Two sample participants. It would be really interesting to identify a point in time or boundary conditions surrounding the venture development process whereby larger networks with a large depth of knowledge become deleterious and network breadth and/or efficiency become important. Establishing these types of relationships would help to move the literatures on dynamic networks and new venture development forward.

Finally, although it is somewhat difficult to definitely state that the results for relationships examining the strength of ties suggest that managing the number and types of ties within entrepreneurs' networks is a surefire way of understanding and managing the dynamics of entrepreneurs' networks, the results reported here suggest that this is an area for additional future work. Although the results from Study Two (mass mail sample) seem quite valid, the conflicting results across Study One (PSED) and Study Two make additional investigations necessary. Future work examining dynamic entrepreneurial networks should take caution when determining the procedures used to collect repeated measures or longitudinal data, being sure to capture all of the changes across all network partners. Without doing so could compromise the construct and internal validity of the study (Shadish, Cook, & Campbell, 2002). Additionally, even though the post hoc results in Study Two (mass mail) that examined the different measures of tie strength are consistent, future work should take care when measuring the frequency of different network ties (e.g., strong and weak ties) and other work could further integrate the idea of the different proportions of weak and strong ties. To begin unlocking the mystery of the inconsistent findings across studies and in an effort to discover the true dynamics involved when examining the effects of weak ties on subsequent network characteristics, studying these relationships in a follow-up survey of Study Two participants would be interesting.

Implications

Theoretical Implications

This dissertation offers contributions to work in entrepreneurship examining dynamic entrepreneurial networks as well as to work within economics and that examining the knowledge-based view (KBV). I developed a dynamic model of entrepreneurial networks over new venture emergence and early growth and examined how over time entrepreneurs' networks interact with entrepreneurs' characteristics to influence entrepreneurial outcomes during new venture emergence and early growth. I specifically focused on business-relevant knowledge held by the entrepreneur and the entrepreneurs' network partners and I also integrated work that examines how different structural configurations of entrepreneurs' networks will impact this process. Although the results of many of these hypotheses were inconclusive, the results did suggest the potential for exploring boundary conditions such as team-founded versus solo-founded ventures when studying dynamic entrepreneurial networks.

I also examined how entrepreneurs themselves change as a result of their interactions with their networks over time and due to the new venture emergence and early development process. The results of these relationships suggest, at least marginally, that one way entrepreneurs learn is through interacting with a comprehensive set of knowledgeable network partners. Should this finding be substantiated by future work examining this relationship in studies with more statistical power, then this finding might contribute to work on social capital and organizational networks (cf., Inkpen & Tsang, 2005; Nahapiet & Ghoshal, 1998).

The results of this study also contribute to these streams of literature by suggesting that during early stages of venture development the scale or depth of knowledge present within the

external environment (network size) might be more important than the scope or breadth of the knowledge in the external environment (network knowledge heterogeneity), at least when explaining entrepreneurial outcomes like the growth of the venture in terms of the number of employees and when studying variables like the speed with which entrepreneurs hire their first employee.

Another theoretical contribution expands work from Hite and Hesterly (2001), Hite (2005), Borgatti, et al. (1998), and others studying dynamic entrepreneurial networks by going beyond asserting that entrepreneurs' networks change to address changing resource needs over time. This dissertation was a first attempt at explaining how and with what network changing consequences entrepreneurs networks do and should change to achieve different entrepreneurial and network characteristic ends.

Methodological Implications

Although not hypothesized, the study revealed some potentially important methodological issues associated with studying dynamic entrepreneurial networks. Two issues arose: 1) the relationship between network size and knowledge and 2) avoiding construct and internal validity problems when assessing dynamic networks and specifically when measuring the strength of network ties.

With regard to number one, researchers examining relationships that include constructs of network size and network knowledge heterogeneity, efficiency, or the like should be very careful in interpreting the results of their studies. The results of this dissertation suggest that network size might be a good indicator of the scale or depth of the knowledge present within the network and network knowledge heterogeneity or efficiency might be a good indicator of the scope or breadth of the networks. Future work should further explore when these constructs are

applicable to the entrepreneurial process and also take care when selecting and interpreting these constructs within their studies.

With regard to the second issue, researchers studying dynamic entrepreneurial networks should be mindful of their research designs, being sure to collect the appropriate data over the necessary time frames. This also suggests that utilizing secondary data sources might not be the best option when trying to ensure that the exact variables are collected at the exact data points necessary. Further, researchers should continue to explore the issues associated with collecting network tie strength data utilizing varying measurement methods. With few exceptions, researchers have mostly relied on measuring tie strength utilizing one method such as closeness or frequency (Perry-Smith, 2006). Although the results across Study Two (mass mail) find consistent results across measures of tie strength, future work should begin to establish a higher order tie strength construct and corresponding scale or should converge on one single reliable measurement of tie strength.

Practical Implications

Work studying the KBV and economics suggests that knowledge resources necessary for developing firms exist in the external environment and that in order for entrepreneurs to gain access to these resources they must interact with that external environment (Yates, 2000; Kogut & Zander, 1992; Itami & Roehl, 1987). The results of some of the relationships investigated here support this notion, suggesting that when entrepreneurs have large networks, as their individual business expertise increases so does the size of their firms. This suggests that if growing the firm in terms of the number of employees is important for an early-stage entrepreneur, having a comprehensive understanding of the business environment and a large network of resource providers can enhance the size of their firm.

Due to the fact that having a large firm can help to grow the size of the firm when entrepreneur expertise increases, understanding how to 1) increase the expertise of the entrepreneur and 2) increase the size of the network might be important.

The results of this dissertation suggest that one potential way to increase the size of the network is to garner a network with many weak tie partners and to maintain a large network during the periods when venture growth in employees is important. With regard to elaborating the expertise of the entrepreneur, and given that the results are only marginally significant and thus a candidate for future research, it might be possible that a knowledgeably comprehensive network will help to expand the breadth of the entrepreneurs' expertise over time. This suggests that an entrepreneur might carefully select their network partners such that the network would include a diverse set of business-area experts.

Limitations

Study One (PSED) Limitations

Although this study has a number of benefits, it also suffers from some limitations and some issues that must be taken into consideration when determining the viability of this study for testing my model. These issues arise due to the secondary nature of the data.

The most important limitation of the data is that not all variables required for testing my model were collected and/or once I sorted through the data that was available the substantial amount of missing data points or missing data collection waves made testing many of the model's predictions impossible.

Another limitation, related to the first, was the sample size. That is, once I sorted through the variables available to test parts of my model's predictions, the sample size reduced to $n = 59$,

which compromises the statistical power with which I can detect relationships (Cohen, et al., 2003). Although I cannot be absolutely certain, I also believe that the manner in which some of the data were collected (e.g., the strength of tie data) was not entirely appropriate or as I had intended for testing my model.

There are also a couple of limitations of the sample that should be discussed. The first limitation of the sample is that individuals were screened and included in the nascent entrepreneur (NE) sample even when they were starting the business for their employers or as a part of a job assignment. Although the criteria used that lead these individuals to be included in the NE sample distinguished them from *intrapreneurs* (those a part of a corporate venturing activity), the inclusion of these individuals is not entirely consistent with the sampling frame that I used for Study Two, again, limiting the validity of comparisons across studies.

Another potential issue with the nature of the sample is that respondents were included regardless of their role in creating the firm. That is, as long as they were somehow involved in the ownership (majority or not) of the venture, they were included in the sample. Thus the inclusion of these respondents somewhat limits the validity in comparing results across studies as I screened the data for Study Two to include only majority owners of the firms.

Study Two (Mass Mail Sample) Limitations

The most substantial limitations of Study Two is that the data are cross-sectional in nature and that retrospective recall was used for collecting information on previous states of the entrepreneurs' networks, entrepreneurs' knowledge sets, and the dates of benchmark entrepreneurial outcomes. This method, however, is consistent with other work on dynamic networks and the dynamics of entrepreneurship (cf., Greve & Salaff, 2003; Lechner, et al., in

press). Moreover, precautions as suggested by Huber and Power (1985) were followed to lessen the potential biases caused by retrospective recall data. Further, since some (albeit only a few) of the results of Study Two were replicated with the PSED this is suggestive that the results obtained were valid. With regard to problems associated with the use of cross-sectional data for testing relationships that occur over time, I am limited in the causal conclusions that I am able to reach. That is, not having observed the relationships in longitudinal manner or utilizing repeated measures precludes me from being able to make more definitive conclusions regarding the causal nature of the observed relationships (Shadish, et al., 2002).

Another potential limitation is that this study is biased toward successful firms. Although in sending out the surveys I requested that the participants please complete the survey regardless of whether their venture was active or not, all of the participants returning the surveys reported that their firms were active. As a result, I will not be able to test differences in the relationships across successful and unsuccessful firms, which might be an interesting comparison in terms of the relationships studied. I believe that this is only a mild limitation, however, because of two reasons. First, I am interested in the network characteristics and entrepreneurs' knowledge states and their associated dynamics as they correspond to *successful* venture development. Second, the nature of the variables allows for some variance in the *relative* success of the ventures through development (e.g., the relative frequency of weak ties, the total number of first year sales, firm growth in the total number of full-time employees, the relative comprehensiveness of entrepreneurs' knowledge states and network knowledge resources). Thus, I should be able to make at least some cursory assertions as to the impact of the variables on the *relative* success of new ventures.

A third, more general, limitation present in Study One and Study Two, and one that future work should address, has to do with the network measures used for collecting network data and their construct validity relative to the constructs that they seek to assess. For example, work examining entrepreneurs' networks size often equates network size or network density to network knowledge. That is, researchers often integrate the construct of network size or network density in hopes of these variables acting as proxies for the content or knowledge present within entrepreneurs' networks. Work including measures intended to assess the diversity or efficiency of the knowledge and/or resources present within entrepreneurs' networks (e.g., network knowledge heterogeneity), and those including measures of tie strength intend these variables as proxies as well. That is, in general, work including these network structure and content variable intend the measures to assess the quality of the partners with the entrepreneurs' networks. In fact, though, these variables are only really provide a description of the network. That is, network size, while it may capture the notion of the *amount* of knowledge or resources present within entrepreneurs' networks, it does nothing to account for the value of the resources in the network. The same is the case for variables included in studies for network knowledge heterogeneity. That is, variables similar to those like network knowledge heterogeneity are able to assess the *scope* of resources available, but again not the value of these resources.

The same is true for the strength of tie variables that we, as network researchers, study. For example, while research has studied tie strength (e.g., strong versus weak ties) or network tie partner types (e.g., formal versus informal ties), the methods generally used for studying these variables do not effectively address the issue of value of the tie. For example, family members are generally classified as strong tie partners. However, one can imagine the situation where the relationship between a person and their family members might be distant, lessening the quality of

the resources that the entrepreneur would receive from those individuals. If researchers only measured the “quality” of the tie by using this type of classification they might be erring in that although family members are often classified as strong tie partners, the type of relationship just described would certainly not be one where the entrepreneur would capitalize on the socioemotional and depth of information benefits generally associated with these types of partners. Although others have included measures of tie strength such as the frequency, duration, and closeness of the relationships between actors and their network partners, these measures are still limited in their ability to accurately assess the *quality* of the resources received from these network partners.

Consequently, these issues pose some limitations to the conclusions that can be derived from this and other work studying networks and it also suggests areas where future work could benefit. That is, future work could benefit from integrating alternative, more valid, measures of network quality. Perhaps simple Likert-type scales asking respondents to indicate the overall quality of the relationship in terms of developing their venture. Studying more precise representations of the constructs that we seek to assess might present a more accurate picture of the phenomena that we study.

A final limitation to Study Two is the low response rate of returned surveys. While post hoc analyses were conducted to determine if there was a statistically significant difference between respondents and nonrespondents and these analyses revealed the notion that the effective response rate might actually have been higher than the 10.32% reported, this also presents another suggestion for future work to consider. Specifically, instead of utilizing a mass mail solicitation sampling strategy like that used for Study Two, a better approach might be to screen the sample first (e.g., via telephone, internet, etc.) and through this screening identify a

sample of 200-300 participants who agree to complete the survey. Following this initial agreement, researchers can initiate the survey mailings and then follow these individuals over time to collect repeated measures or longitudinal data.

Conclusion

Research studying entrepreneurship and networks has recently begun to look at the dynamics of entrepreneurial networks over time. Although previous work has primarily been theoretical in nature, a few qualitative and empirical papers have recently emerged (e.g., Greve & Salaff, 2003; Hite & Hesterly, 2001; Hite, 2005; Larson & Starr, 1993; Lechner & Dowling, 2003; Lee, et al., 2001; Leung, 2003). My dissertation sought to contribute theoretically to this already growing literature through integrating robust theoretical frameworks such as resource dependence theory (Pfeffer, 1978; Pfeffer and Salancik, 1978), the resource-based view (Penrose, 1959; Barney, 1991), and its offshoot the knowledge-based view (Grant, 1996; Conner & Prahalad, 1996). Overall, the results of two studies testing the theoretical model are mixed relative to their support of the model's assertions. This suggests that additional work must be done to clarify and refine the ideas used to develop the model and changes to parts of the model must be made. Regardless, I hope that as my work and the work of others' continues to explore this topic we will be able to integrate our thinking and establish boundary conditions as to why, when, how, and with what consequences entrepreneurs' networks are dynamic.

Appendix A: Overview of Theories Related to Venture Emergence and Development

With regard to theories of venture emergence and development, I rely on work that has appeared within the entrepreneurship literature that has sought to delineate specific characteristics relevant to new venture creation, emergence, and development. Although I recognize that much of this work stems from developments derived from more general theories of the firm, my purpose is not to utilize a theory of the firm as such. The reason I chose to focus on this subset of work within the venture creation, emergence, and development literature is that I do not intend to address both questions that theories of the firm seek to answer. Specifically, theories of firms seek to address two issues: 1) why firms exist (e.g., explaining organizing via hierarchies versus markets using efficiency explanations), and 2) what determines the scale and scope of firms (Conner & Prahalad, 1996). At best, I attempt to explain some issues related to determinants of the scale and scope of firms, but I am mostly concerned with the subset of the literature discussing early stages of firm development from emergence and immediately following firm birth²⁹.

In the present section, I will limit my review to those works that have appeared in the entrepreneurship literature and those that have focused on the relative stages, or phases, of new venture development. To reiterate, my purpose in relying on these perspectives is that I do not argue for the relative efficiency of organizing via firms or markets, but rather I utilize this work to help distinguish markers of the venture emergence and development processes.

As briefly mentioned above, theories of the firm originally sought to answer questions as to why firms are organized via hierarchies as opposed to markets. Although within the broader

²⁹ As will become clear in the next several pages, based on my review of the literature, I conceptualize firm emergence as the stage of development prior to firm birth. Research suggests that firm birth can be thought to have occurred at the achievement of some marker event such as first sale. Following firm birth, I conceptualize the firm to be in the early growth stage. Thus, I use the term “emergence” to refer to the time period prior to birth as indicated by some appropriate marker event, and the terms “development” or “growth” to equally mean the stages after firm birth (to the point of inflection in the gazelle stage in illustrated in Chapter 1 Figure 1).

organizational sciences this question has received much attention, many researchers have moved beyond this debatably important question (Alchian & Demsetz, 1972; Masten, 1988) and have essentially accepted the notion that regardless of economic reasons for firm organization establishment, firms do exist and they need to be studied beyond economic efficiency reasons. Thus, a group of work was generated that has sought to uncover the nature of firm evolution over time. Specifically, this work has examined the notion that ventures evolve over time, often toward more well developed forms of organization.

Initial work in this tradition examined this evolutionary process through organizational life cycle models (Churchill & Lewis, 1983; Kazanjian & Drazin, 1989; 1990). Although different works have examined different aspects of the organizational life cycle, the most general and well accepted organizational life cycle model is presented in Chapter 1 Figure 1.

In its most basic form, this model asserts that a venture is initially started and, as it successfully develops through the initial start-up phase, the firm will exhibit some pattern of organizational growth. After successfully developing through the growth stage, the firm will either continue growing and become a large firm, plateau and remain a small-to-medium sized firm (SME), or the firm will fail and will cease to exist.

As illustrated in Chapter 1 Figure 1, these broadly conceptualized models tend to consider the evolution of firms from birth through some period of establishment or fallout. Within entrepreneurship research, scholars relying on these models have taken a slightly different focus. They have argued that in order to fully understand the existence of new firms, we must study organizations-in-creation. In order to do so, it is argued, we must move from studying existing firms retrospectively and study firms that are “in creation”. What is more, researchers have argued, is that in order to study organization-in-creation, we must be able to

identify the properties of emerging organizations (Katz & Gartner, 1988). Thus, the focus within entrepreneurship in this view has sought to 1) more finely distinguish the boundaries of organizational establishment – sometimes called stages, or phases of venture development, and 2) examine ventures prior to birth. Further, in attempting to justify entrepreneurship as a scholarly domain in itself, these researchers have even defined entrepreneurship via these stages (especially those stages prior to the gazelle stage of development as illustrated in Chapter 1 Figure 1) and they have studied the character and phenomena relevant to these distinct stages.

Katz and Gartner (1988), in attempting to identify the properties of emerging organizations, sparked much interest on this topic within the entrepreneurship literature. Four properties of the emerging organization were identified by these researchers. They include intentionality, resources, boundary, and exchange. *Intentionality* was described as the purposeful seeking of information useful for starting a new organization. *Resources* were described as the tangible components (e.g., supplies) needed to form the organization. Interestingly, intangible resources such as information were not included in these early models. *Boundary* was considered as concrete markers that identify an organization as such (e.g., tax number application). Finally, *exchange* was defined as all of the transactions occurring both within and beyond the newly emerging organization.

Based on the early work by Katz and Gartner (1988), and specifically drawing from their notion of boundary as a property of emerging organizations, others focused on identifying specific developmental stages of new venture growth from conception through organizational establishment (Kazanjian & Drazin, 1989; 1990). This work has become known as the stages model of venture founding (Hansen & Bird, 1997) and it has taken some hold within the literature. The stages model of venture founding contends that certain organizational boundaries

(as discussed by Katz and Gartner (1988)) signal different stages of venture development. For example, Hansen (1991; 1995) has proposed that a new venture transitions from the pre-organization stage to the emerging organization stage as signaled by the hire of the first full-time employee and/or after achieving the first commercial sale (Hansen & Bird, 1997).

Others in this tradition began looking at and delineating finer-grained characteristics of the earlier phases of development such as the gestation/incubation process (Reynolds & Miller, 1992). In their inquiry, Reynolds and Miller explored four events of the firm gestation process: founder commitment, first hire, start-up financing, and first sales. Although their results revealed variations in the order and timing with which these events occurred across firms in the gestation process, they concluded that the date of the first sale appears to be the most appropriate marker of firm “birth”, if only one marker event is used.

More recent work in entrepreneurship, borrowing from this stream of research, has continued to focus on the idiosyncrasies of new venture development from the very beginning stages of the firm, including phases prior to firm birth³⁰ (also called firm emergence) through stages of new venture early growth (cf., Hite & Hesterly, 2001, for example, look at network embeddedness over early stages of venture development).

In this paper, I investigate the early stages of new venture emergence and development. Thus, the time periods of interest here correspond to the life cycle stages of new venture emergence and early growth, as exhibited in Chapter 1 Figure 1. This choice was made for theoretical and practical reasons.

³⁰ Although there has been some debate as to when firm birth is thought to have occurred, based on the literature reviewed the general consensus is that a “new firm is an active participant in the economy” [Reynolds & Miller, 1992: 405]. As such, some major firm event such as first sale or hire date of first full-time employee must have occurred (Gartner, Shaver, Carter, & Reynolds, 2004; Hansen & Bird, 1997). Prior to firm birth as indicated by a marker event, the firm is considered to be in the emergence or gestation stage. I use the term “emergence” to indicate this time period in the present paper.

The model that I later propose asserts that the nature of entrepreneurs' knowledge states and their networks will change over time. Theoretically, I believe that during early stages of venture creation, the character of entrepreneurs' networks will be particularly likely to exhibit a dynamic and evolutionary nature. This notion is consistent with previous work that notes that young firms are most likely to be impacted by external relationships (Eisenhardt & Schoonhoven, 1996; Yli-Renko, Autio, & Sapienza, 2001). Further, the impact of these changes on entrepreneurs is likely to be greater in earlier periods of venture development since the entrepreneur is so intimately involved with the development of the firm during these early stages (Kazanjian & Drazin, 1990; Larson & Starr, 1993). It is also likely that studying a better organized or developed venture, having already successfully evolved through the phases of interest here, would leave a lack of understanding as to how the firm developed to the more organized state.

I also rely on the work that suggests specific marker events as indicators of successful (or not successful) new venture emergence. Specifically, I draw from this work to 1) assist me in identifying appropriate firms for the samples that will be included in my studies, and 2) to argue that, especially during early new venture development, the achievement of these marker events will act as indicators of legitimacy to important networks of resource providers. As will become clear in the explanation of my model in Chapter 2, I argue that the achievement of these marker events will assist the entrepreneur in expanding their networks to include other, new, important resource providers that will aid in the further development of the new venture.

In terms of the practical reasons for focusing on these early stages of development, acquiring longitudinal data is expensive and timely. The longitudinal, empirical, data that are available to test some of the model's assertions (Study One, Chapter 3) focuses on the early

stages of venture development³¹ and includes early-stage data about the founding entrepreneur, as opposed to later-stage data.

³¹ As will be discussed later in the description of Study One the nature of the data focuses on new ventures from emergence through 3-4 years of development. Further, as funding permits, this data is a part of an ongoing data collection project being undertaken by the University of Michigan and the Panel Study of Entrepreneurial Dynamics (PSED), sponsored by the Ewing Marion Kauffman Foundation. Additionally, as will be described in Study Two, the present research effort seeks to set up an ongoing data collection procedure that will allow for more well developed ventures to be assessed.

Appendix B: Institutional review board (irb) aproval for survey study



Office of Research & Commercialization

January 17, 2006

Diane M. Sullivan
1380 Muirfield Drive
Titusville, FL 32780

Dear Ms. Sullivan:

The University of Central Florida's Institutional Review Board (IRB) received your protocol IRB #06-3155 entitled, "**How Entrepreneurs' Networks Impact Business Development.**" The IRB Chair did not have any concerns with the proposed project and has indicated that under federal regulations, Category #2, research involving the use of educational tests, survey or interview procedures, or the observation of public behavior, so long as confidentiality is maintained, this research is **exempt** from further review by our IRB, so an approval is not applicable and a renewal within one year is not required. The data is public information.

Please accept our best wishes for the success of your endeavors. Should you have any questions, please do not hesitate to call me at 407-823-2901.

Cordially,

Barbara Ward

Barbara Ward, CIM
IRB Coordinator

Copies: IRB File
Cameron Ford, Ph.D.
Foard Jones, Ph.D.

BW;jm



THE UNIVERSITY OF CENTRAL FLORIDA
INSTITUTIONAL REVIEW BOARD (IRB)

IRB Committee Approval Form

PRINCIPAL INVESTIGATOR(S): **Diane M. Sullivan** IRB #: 06-3155
(Supervisors: **Cameron Ford, Ph.D.**
and **Foard Jones, Ph.D.**)

PROJECT TITLE: **How Entrepreneurs' Networks Impact Business Development**

- New project submission
- Continuing review of lapsed project # _____
- Study expires
- Initial submission was approved by full board review but continuing review can be expedited
- Suspension of enrollment email sent to PI, entered on spreadsheet, administration notified _____
- Resubmission of lapsed project # _____
- Continuing review of # _____
- Initial submission was approved by expedited review
- Suspension of enrollment email sent to PI, entered on spreadsheet, administration notified _____

Chair

IRB Reviewers:

Expedited Approval

Dated: _____
Cite how qualifies for expedited review: minimal risk and _____

Signed: _____
Dr. Sophia Dziegielewski, Vice-Chair

Exempt

Dated: 1/13/06
Cite how qualifies for exempt status: minimal risk and #2

Signed: _____
Dr. Jacqueline Byers, Chair
Signed: Tracy B. Dietz
Dr. Tracy Dietz, Designated Reviewer

Expiration

Date: _____

Complete reverse side of expedited or exempt form

- Waiver of documentation of consent approved
- Waiver of consent approved
- Waiver of HIPAA Authorization approved

NOTES FROM IRB CHAIR (IF APPLICABLE): _____

Waiver of Doc of Consent Approved

ENDNOTES

¹ I should note at this early point in the exposition that although I review the two theoretical underpinnings explaining networks in organizational contexts, I will rely on resource dependence arguments to support my model's assertions. This is because resource dependence provides the appropriate theoretical propulsion to drive the model's assertions. Specifically, the model investigates how, due to different resource requirements over time, entrepreneurs' networks change to address these changing resource needs. As such, this general line of reasoning corresponds to resource dependence thinking that asserts that firms will seek to gain control over resources that they need. Transaction cost economics (TCE) thinking relies on the notion of creating efficiencies through organizing modes. The model that I develop is not concerned with efficient organizing methods via networks and thus a TCE-based explanation for networks will not be utilized within this work. Moreover, TCE-based explanations for networks often utilize a "network organization" line of thinking whereby the actual organizational form is considered as a hub-and-wheel configuration of firms (Bluedorn, et al., 1994; Jarillo, 1988). The notion of networks used here follows more of a social network perspective and thus does not correspond to the network organization as discussed by TCE. Regardless, I review both resource dependence theory and TCE as they explain networks in organizational settings for comprehensiveness purposes. Due to my reliance on resource dependence theory, though, I more thoroughly review the work relying on its tenets.

REFERENCES

- Agarwal, R., Echambadi, R., Franco, A.M., & Sarkar, M.B. (2004). Knowledge transfer through inheritance: Spin-out generation, development, and survival. *Academy of Management Journal*, 47(4), 501-522.
- Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administration Science Quarterly*, 45, 425-455.
- Alchian, A.A. & Demsetz, H. (1972). Production, information costs, and economic organization. *American Economic Review*, 62(5), 777-795.
- Aldrich, H.E. & Carter, N.M. (2004). Social networks. In Gartner, Shaver, Carter, & Reynolds (Eds.). *Handbook of Entrepreneurial Dynamics: The Process of Business Creation*. London: Sage Publications.
- Aldrich, H.E. & Martinez, M.A. (2001). Many are called, but few are chosen: An evolutionary perspective for the study of entrepreneurship. *Entrepreneurship, Theory, and Practice*, 41-56.
- Aldrich, H., Renzulli, L., & Langton, N. (1998). Passing on the privilege: Resources provided by self-employed parents to their self-employed children. In K. Liecht (Ed.), *Research in social stratification and mobility*. Greenwich, CT: JAI.
- Alvarez, S. & Busenitz, L. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, 27, 755-775.
- Baker, W.E. & Faulkner, R.R. (2002). Interorganizational networks. In Baum, J.A.C [Ed.], *The Blackwell Companion to Organizations*. Oxford, UK: Blackwell Business.

- Barney, J.B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.
- Barringer, B. R. & Ireland, R.D. (2006). *Entrepreneurship: Successfully launching new ventures*. New Jersey: Prentice Hall.
- Bates, T. (1997). *Race, Self-Employment, and Upward Mobility*. Woodrow Wilson Center Press: Washington, DC.
- Baum, J.A.C., Calabrese, T., & Silverman, B.S. (2000). Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management Journal*, 21, 267-294.
- Birley, S. (1985). The role of networks in the entrepreneurial process. *Journal of Business Venturing*, 1(1), 107-117.
- Blau, P.M. (1977). *Inequality and Heterogeneity*. New York: Free.
- Bluedorn, A.C., Johnson, R.A., Cartwright, D.K. & Barringer, B.R. (1994). The interface and convergence of the strategic management and organizational environment domain. *Journal of Management*, 20(2), 201-262.
- Borgatti, S.P. & Foster, P.C. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management*, 29(6), 991-1013.
- Borgatti, S.P., Jones, C., & Everett, M.C. (1998). Network measures of social capital. *Connections*, 21: 27-36.
- Brüderl, J. & Preisendörfer, P. (1998). Network support and the success of newly founded businesses. *Small Business Economics*, 10, 213-225.

- Burt, R.S. (2000). Creating careers: Women's paths through entrepreneurship. Ronald Burt's website of working papers:
<http://gsbwww.uchicago.edu/fac/ronald.burt/research/>.
- Burt, R.S. (2004). Structural holes and good ideas. *American Journal of Sociology*, 110(2), 349-399.
- Burt, R.S. (2001). Attachment, decay, and social behavior. *Journal of Organizational Behavior*, 22(6), 619-643.
- Burt, R.S. (1992). *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Burt, R.W., Hogarth, R.M. & Michaud, C. (2000). The social capital of French and American managers. *Organization Science*, 11(2), 123-147.
- Burt, R.W. & Ronchi, D. (1994). Measuring large networks quickly. *Social Networks*, 16, 91-135.
- Bygrave, W.D. (1988). The structure of investment networks of venture capital firms. *Journal of Business Venturing*, 3(2), 137-157.
- Churchill, N.C. & Lewis, V.L. (1983). The five stages of small business growth. *Harvard Business Review*, 61(3), 52-60.
- Chang, S.J. (2004). Venture capital financing, strategic alliances, and the initial public offering of internet startups. *Journal of Business Venturing*, 19(5), 721-741.
- Coase, R. (1937). The nature of the firm. *Economica N.S.*, 4, 386-405.
- Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. New Jersey: Laurence Erlbaum.

- Cohen, W.M. & Levinthal, D.A. (1990). Absorptive Capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Collinson, S. & Gregson, G. (2003). Knowledge networks for new technology-based firms: An international comparison of local entrepreneurship promotion. *R&D Management*, 33(2), 189-208.
- Conner, K.R. & Prahalad, C.K. (1996). A resource-based theory of the firm: Knowledge versus opportunism. *Organization Science*, 7(5), 477-501.
- Cook, K.S. & Emerson, R.M. (1978). Power, equity and commitment in exchange networks. *American Sociological Review*, 43(5), 721-739.
- Cook, K.S., Emerson, R.M., Gillmore, M.R., & Yamagishi, T. (1983). The distribution of power in exchange networks: Theory and experimental results. *American Journal of Sociology*, 89, 275-305.
- Cook, K.S. & Whitmeyer, J.M. (1992). Two approaches to social structure: Exchange theory and network analysis. *Annual Review of Sociology*, 18, 109-127.
- Craig, J. & Lindsay, N. (2001) Quantifying 'Gut Feeling' in the Opportunity Recognition Process. In W. D. Bygrave, et al. (Eds.), *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College.
- Cromie, S. & Birley, S. (1992). Networking by female business owners in Northern Ireland. *Journal of Business Venturing*, 7(3), 237-252.
- Davidsson, P. & Honig, B. (2003). The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing*, 18, 301-331.

- Deeds, D.L. & Hill, C. (1996). Strategic alliances and the rate of new product development: An empirical study of entrepreneurial biotechnology firms. *Journal of Business Venturing*, 11(1), 41-55.
- Dew, N., Velamuri, S.R. & Venkataraman, S. (2004). Dispersed knowledge and an entrepreneurial theory of the firm. *Journal of Business Venturing*, 19, 659-679.
- Dillman, D.A. (2000). *Mail and Internet Surveys: The Tailored Design Method*. New York: John Wiley & Sons, Inc.
- Dyer, J.H. & Nobeoka, K. (2000). Creating and managing a high-performance knowledge-sharing network: The Toyota case. *Strategic Management Journal*, 31(3), 345-404.
- Eisenhardt, K.M. & Schoonhoven, C. (1996). Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organization Science*, 7: 136-150.
- Elfring, T. & Hulsink, W. (2002). Networks in entrepreneurship: The case of high-technology firms. *Small Business Economics*, 21, 409-422.
- Fiet, J.O. (1996). The informational basis for entrepreneurial discovery. *Small Business Economics*, 8, 419-430
- Ford, C.M. & Sullivan, D.M. (Forthcoming). A Multi-Level Process View of New Venture Emergence. In Mumford, M. (Ed.) *Multi-level issues in organizational behavior and strategy (Vol. 4 of Research in multi-level issues)*. Oxford, UK: Elsevier Science.
- Freeman, L.C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks*, 1, 215-239.

- Gargiulo, M. (1993). Two-step leverage: Managing constraint in organizational politics. *Administrative Science Quarterly*, 38(1), 1-19.
- Gartner, W.B., Shaver, K.G., Carter, N.M. & Reynolds, P.D. (2004). *Handbook of Entrepreneurial Dynamics: The Process of Business Creation*. Thousand Oaks, California: Sage Publications.
- Gaskill, L.R. & Van Auken, H.E. (1993). A factor analytic study of perceived causes of small business failure. *Journal of Small Business Management*, 31(4), 18-31.
- Gemser, G., Leenders, M.A., & Wijnberg, N.M. (1996). The dynamics of inter-firm networks in the course of the industry life cycle. *Technology Analysis & Strategic Management*. 8(4), 439-453.
- Gemünden, H.G., Ritter, T., & Heydebreck, P. (1996). Network configuration and innovation success: An empirical analysis in German high-tech industries. *International Journal of Research in Marketing*. 13(5), 449-462.
- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360-1380.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3), 481-510.
- Grant, R.M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17, 109-122.
- Greve, A. & Salaff, J.W. (2003). Social Networks and Entrepreneurship. *Entrepreneurship, Theory, and Practice*, 28 (1), 1-22.

- Gulati, R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal*, 20(5), 397-420.
- Gulati, R., Dialdin, D.A., & Wang, L. (2002). Organizational networks. In Baum, J.A.C [Ed.], *The Blackwell Companion to Organizations*. Oxford, UK: Blackwell Business.
- Gulati R. & Gargiulo, M. (1999). Where do interorganizational networks come from? *American Journal of Sociology*, 104(5), 1439-1493.
- Hansen, E.L. (1991). Structure and process in entrepreneurial networks as partial determinants of initial new venture growth. In R. Ronstadt, N. Churchill, W. Bygrave, D. Sexton, D. Slevin, K. Vesper, and W. Wetzel [Eds.], *Frontiers of Entrepreneurship Research*, pp. 320-334. Wellesley, MA: Babson College.
- Hansen, E.L. (1995). Entrepreneurial network and new organization growth. *Entrepreneurship, Theory, and Practice*, 19(4), 7-20.
- Hansen, E.L. & Bird, B.J. (1997). The stages model of high-tech venture founding: Tried but true? *Entrepreneurship, Theory, and Practice*, 22(2), 111-122.
- Hargadon, A.B. & Sutton, R.I. (1997). Technology Brokering and Innovation in a Product Development Firm. *Administrative Science Quarterly*, 42, 716-749.
- Hillman, A.J. & Dalziel, T. (2003). Boards of directors and firm performance: Integrating agency and resource dependence perspectives. *Academy of Management Review*, 28(3), 383-396.

- Hills, G.E., Lumpkin, G.T., & Singh, R. (1997). Opportunity Recognition: Perceptions and Behaviors of Entrepreneurs. *Frontiers of Entrepreneurship Research*, 17: 168–182.
- Hills G. E., Shrader, R. C., & Lumpkin, G. T. (1999). Opportunity recognition as a creative process. In P. D. Reynolds, W. D. Bygrave, S. Maingart, C. Mason, G. D. Meyer, H. Sapienza, & K. G. Shaver, (Eds.), *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College.
- Hite, J.M. (2005). Evolutionary processes and paths of relationally embedded network ties in emerging entrepreneurial firms. *Entrepreneurship, Theory, and Practice*, 29(1), 113-144.
- Hite, J.M. & Hesterly, W.S. (2001). The evolution of firm networks: From emergence to early growth of the firm. *Strategic Management Journal*, 22, 275-286.
- Hoang, H. & Antoncic, B. (2003). Network-based research in entrepreneurship: A critical review. *Journal of Business Venturing*, 18, 165-187.
- Huber, G.P & Power, D.J. (1985). Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal*, 6, 171-180.
- Human, S.E. & Provan, K.G. (2000). Legitimacy building in the evolution of small-firm multilateral networks: A comparative study of success and demise. *Administrative Science Quarterly*, 45(2), 327-416.
- Ingram, P. & Baum, J.A.C. (1997). Opportunity and constraint: Organizations' learning from the operating and competitive experience of industries. *Strategic Management Journal*, 18, 75-98.

- Inkpen, A.C. & Tsang, E.W.K (2005). Social capital, networks, and knowledge transfer. *Academy of Management Review*, 30(1), 146-165.
- Isett, K.R. & Provan, K.G. (2005). The evolution of dyadic interorganizational relationships in a network of publicly funded nonprofit agencies. *Journal of Public Administration Research and Theory*, 15(1), 149-165.
- Itami, H. & Roehl, T.W. (1987). *Mobilizing Invisible Assets*. Cambridge, MA: Harvard University Press.
- Jarillo, J.C. (1988). On strategic networks. *Strategic Management Journal*, 9, 31-41.
- Jarillo, J.C. (1990). Comments on 'transaction costs and networks'. *Strategic Management Journal*, 11, 497-499.
- Johannisson, B. (1996). The dynamics of entrepreneurial networks. In Reynolds, P.D., Birley, S., Butler, J.E., Bygrave, W.D., Davidsson, P., Gartner, W.B., & McDougall, P.P. [Eds.]. *Frontiers of Entrepreneurship Research*, pp. 352-267, Wellesley, MA Babson College.
- Katz, J. & Gartner, W.B. (1988). Properties of emerging organizations. *Academy of Management Review*, 13(3), 429-441.
- Kazanjian, R.K. & Drazin, R. (1989). An empirical test of a stage growth progression model. *Management Science*, 35(12) 1489-1503.
- Kazanjian, R.K. & Drazin, R. (1990). A stage-contingency model of design and growth for technology based new venture. *Journal of Business Venturing*, 5(3), 137-150.
- Kogut, B. & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383-397.

- Larson, A. & Starr, J.W. (1993). A network model of organizational formation. *Entrepreneurship, Theory, and Practice*, Winter, 5-15.
- Lechner, C. & Dowling, M. (2003). Firm networks: External relationships as sources for the growth and competitiveness of entrepreneurial firms. *Entrepreneurship & Regional Development*, 15, 1-26.
- Lechner, C., Dowling, M., & Welpel, I. (in press). Firm networks and firm development: The role of the relational mix. *Journal of Business Venturing*.
- Lee, C., Lee, J. & Pennings, J.M. (2001). Internal capabilities, external networks, and performance: A study on technology-based ventures. *Strategic Management Journal*, 22(6,7), 615-640.
- Leung, A. (2003). Different ties for different needs: Recruitment practices of entrepreneurial firms at different developmental phases. *Human Resource Management*, 42(4), 303-320.
- March, J.G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2, 71-87.
- Marsden, P.V. & Campbell, K.W. (1984). Measuring tie strength. *Social Forces*, 63, 482-501.
- Masten, S.E. (1988). A legal basis for the firm. *Journal of Law, Economics, and Organization*. 4, 181-198.
- McDonald, M.L. & Westphal, J.D. (2003). Getting by with the advice of their friends: CEO's advice networks and firms' strategic responses to poor performance. *Administrative Science Quarterly*, 48, 1-32.

- McEvily, B. & Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic Management Journal*, 20(12), 1133-1156.
- McPherson, J.M., Smith-Lovin, L., & Cook, J.M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415-444.
- Mertler, C.A. & Vannatta, R.A. (2002). *Advanced and multivariate statistical methods: Practical application and interpretation* (2nd ed.). Los Angeles: Pyrczak.
- Morgan, N.A., Zou, S., Vorhies, D.W. & Katsikeas, C.S. (2003). Experiential and informational knowledge, architectural marketing capabilities, and the adaptive performance of export ventures: A cross-national study. *Decision Sciences*, 34(2), 287-321.
- Nahapiet, J. & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, 23(2), 242-266.
- Nelson, R.E. (1989). The strength of strong ties: Social networks and intergroup conflict in organizations. *Academy of Management Journal*, 32, 377-401.
- O'Connor, G.C. & Rice, M.P. (2001). Opportunity recognition and breakthrough innovation in large established firms. *California Management Review*, 43(2), 95-116.
- O'Donnell, A., Gilmore, A., Cummings, D., & Carson, D. (2001). The network construct in entrepreneurship research: A review and critique. *Management Decision*, 39(9), 749-760.
- Penrose, E. (1959). *The Theory of the Growth of the Firm*. Wiley: New York.

- Perry-Smith, J.E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49(1), 85-101.
- Perry-Smith, J.E. & Shalley, C.E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, 28(1), 89-106.
- Pfeffer, J. (1978). The micropolitics of organizations. In M.W. Meyer and Associates [Eds.], *Environments and Organizations* (pp. 29-50). Jossey-Bass: San Francisco, CA.
- Pfeffer, J. & Salancik, G.R. (1978). *The external control of organizations: A resource dependence perspective*. New York: Harper & Row.
- Raider, H. & Krackhardt, D.J. (2002). Intraorganizational networks. In Baum, J.A.C [Ed.], *The Blackwell Companion to Organizations*. Oxford, UK: Blackwell Business.
- Reagans, R. & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly*, 48, 240-267.
- Reynolds, P. (1994). Reducing barriers to understanding new firm gestation: Prevalence and success of nascent entrepreneurs. Paper presented at the meeting of the Academy of Management, Dallas, TX.
- Reynolds, P.D. (1997). Who starts new firms?—Linear additive versus interaction based models. *Small Business Economics*, 9, 449-462.
- Reynolds, P. (2000). National panel study of U.S. business startups: Background and methodology. *Databases for the Study of Entrepreneurship*, 4, 153-227.

- Reynolds, P.D. (2004). Overview: Life context, personal background. In Gartner, Shaver, Carter, & Reynolds (Eds.). *Handbook of Entrepreneurial Dynamics: The Process of Business Creation*. London: Sage Publications.
- Reynolds, P. & Miller, B. (1992). New firm gestation: Conception, birth, and implications for research. *Journal of Business Venturing*, 7(5), 405-417.
- Ronstadt, R. (1988). 'The Corridor Principle'. *Journal of Business Venturing*, 3, 31-40.
- Rowley, T., Behrens, D., & Krackhardt, D. (2000). Redundant governance structures: An analysis of structural and relational embeddedness in the steel and semiconductor industries. *Strategic Management Journal*, 21, 369-386.
- Ryan, T. P. (1997). *Modern regression methods*. New York: John Wiley & Sons.
- Shadish, W.R., Cook, T.D. & Campbell, D.T (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin Company.
- Shan, W., Walker, G. & Kogut, B. (1994). Interfirm cooperation and startup innovation in the biotechnology industry. *Strategic Management Journal*, 15, 387-394.
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469.
- Shane, S. (2003). *A general theory of entrepreneurship*. Cheltenham, UK: Edward Elgar.
- Shane, S. & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226.
- Shook, C.L., Priem, R.L & McGee, J.E. (2003). Venture creation and the enterprising individual: A review and synthesis. *Journal of Management*, 29(3), 379-399.

- Simon, H.A. (1947). *Administrative Behavior*. Macmillan, New York.
- Singh, R.P., Hills, G.E., Hybels, R.C., & Lumpkin, G.T. (1999). Opportunity recognition through social networks of entrepreneurs. *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 228-241.
- Smith, K.G., Collins, C.J., Clark, K.D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal*, 48(2) 346-357.
- Soh, P-H. (2003). The role of networking alliance in information acquisition and its implications for new product performance. *Journal of Business Venturing*, 18(6), 727-745.
- Spender, J.C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*. 17: 45-62.
- Starr, J.A. & MacMillan, I.C. (1990). Resource cooptation via social contracting: Resource acquisition strategies for new ventures. *Strategic Management Journal*, 11, 79-92.
- Stuart, T.E. (2000). Interorganizational alliances and the performance of firms: A study of growth and innovation. *Strategic Management Journal*, 21(8), 265-284.
- Stuart, T.E., Hoang, H. & Hybels, R. (1999). Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly*, 44, 315-349.
- Thompson, J.D. (1967). *Organizations in Action*. McGraw-Hill: New York.
- Turban, D.B. & Jones, A.P. (1988). Supervisor-subordinate similarity: Types, effects, and mechanisms. *Journal of Applied Psychology*, 73, 228-234.

- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42(1), 35-67.
- Venkataraman, S. (1997). The distinctive domain of entrepreneurship research: An editor's perspective. In J. Katz & R. Brockhaus (Eds.), *Advances in entrepreneurship, firm emergence and growth*: Vol. 3, 119–138. Greenwich, CT: JAI Press.
- Wasserman, S. & Faust, K. (1994). *Social network analysis: Methods and Applications*. Cambridge, UK: Cambridge University Press.
- Watson, J. & Everett, J. (1996). Do small businesses have high failure rates? *Journal of Small Business Management*. 34(4), 45-62.
- Weick, K. (1979). *The Social Psychology of Organizing* (2nd ed.). New York: McGraw-Hill.
- Westphal, J.D. & Zajac, E.J. (1997). Defections from the inner circle: Social exchange, reciprocity, and the diffusion of board independence in U.S. corporations. *Administrative Science Quarterly*, 42(1), 161-183.
- Wiklund, J. & Shepherd, D. (2003). Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses. *Strategic Management Journal*, 24, 1307-1314.
- Williamson, O.E. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press.
- Williamson, O.E. (1985). *The economic institutions of capitalism*. New York: Free Press.
- Williamson, O.E. (1991). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly*. 36, 269-296.

- Witt, P. (2004). Entrepreneurs' networks and the success of start-ups. *Entrepreneurship and Regional Development*, 16(5), 391-412.
- Yates, A.J. (2000). The knowledge problem, entrepreneurial discovery and Austrian market process theory. *Journal of Economic Theory*, 91(1), 59-85.
- Yli-Renko, H, Autio, E., & Sapienza, H.J. (2001). Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, 22, 587-613.
- Zahra, S.A., Nielsen, A.P. & Bogner, W.C. (1999). Corporate entrepreneurship, knowledge, and competence development. *Entrepreneurship, Theory, and Practice*, 23(3), 169-190.
- Zimmer, C. & Aldrich, H. (1987). Resource mobilization through ethnic networks: Kinship and friendship ties of shopkeepers in England. *Sociological Perspectives*, 30, 422-445.