Network-Based Research in Entrepreneurship: A Decade in Review

Ha Hoang
ESSEC Business School
Avenue Bernard Hirsch
95021 Cergy Pontoise Cedex, France
hoang@essec.edu

An Yi
ESSEC Business School
Avenue Bernard Hirsch
95021 Cergy Pontoise Cedex, France
An.yi@essec.edu

The authors would like to thank Janet Bercovitz, Ben Hallen, and Bala Vissa, and participants of the ESSEC MOS seminar series for their comments on an earlier version of this monograph.

Abstract
Since Hoang and Antoncic (2003), network based research in entrepreneurship continues to develop and grow. To chart these developments, we discuss core relational (network content, governance) and structural constructs. We identify recent work that has introduced nodal and contextual constructs: the former capture attributes that inhere in the entrepreneur or venture to explain regularities in the patterns of network change. Contextual constructs reflect higher-level characteristics of the environment that influence lower level processes. The resulting theoretical models upon which empirical studies build reflect how the field as whole has become more rich and complex. Broadly, studies continue to either examine how networks develop over time or what the consequences are for entrepreneurial outcomes. With more studies examining how network ties are initiated, evolve or are culled, our review of work published in the past decade finds that there is now a greater balance across these two streams. The process-oriented studies inform how entrepreneurial networks arise that may in turn lead to successful milestone achievement including financing and venture growth. We conclude by proposing future areas of research that include exploring the malleability of networking competencies, reviving dormant ties, examining the role of team level network constructs in venture performance, and greater incorporation of contextual factors. We also encourage research designs that employ multiple methods in order to better capture the wide range of constructs being incorporated into current theoretical models of networks.
The paper entitled “Network-based research in entrepreneurship: A critical review” summarized a burgeoning research domain focused on understanding the content, governance, and structure of network relations in the entrepreneurial context. Since the article appeared in 2003, numerous new empirical and theoretical articles employing diverse methods have been published suggesting that interest in this topic remains unabated. Similar to the intent of the original review, there is a need to characterize the research conducted in the past decade in order to highlight cumulative or divergent findings, and to identify areas where further research is needed.

Reflecting the various definitions of entrepreneurship that exist in the field, we included papers in our review if they focused on the development and consequences of networks in the new venture creation process or focused on small to medium-sized firms, and family firms. While the scope of the field is broad, it is consistent with that of the Entrepreneurship Division of the Academy of Management and its selection of representative journals.

The insights that appear in the original review came by organizing and evaluating research articles in novel, theoretically relevant groupings. We defined and illustrated the core constructs of network content, structure, and governance. We also assessed the cumulative findings that emerged from organizing articles into two broad areas where network constructs were the main target for explanation (‘Network Constructs as Dependent Variable’) or served as the independent variable to explain entrepreneurial outcomes (‘Network Constructs as Independent Variable’).
Insights from the earlier review have prompted the following questions: To what extent have we now achieved a better balance in terms of our understanding of network processes that lagged behind the body of work on the outcomes of networks? How have network developmental processes been reconceptualized and further complemented by longitudinal study designs? How has our understanding of outcomes been improved when processes are better taken into account? What novel mechanisms have emerged to explain the impact of networks?

This review includes papers that have sought to address these challenging questions and in the process have contributed novel concepts and theory development (for example, Slotte-Kock and Coviello, 2009). In addition, other papers that are relevant and are integrated into our review build more explicitly on topics and issues central to economic sociology, organization theory, strategic management and organizational behavior. By covering a broad spectrum of published work that has emerged in this and related areas over the past 10 years, we seek to consolidate theoretical and empirical developments and identify areas of future research.

Overview of Framework

Three elements of networks are critical to theoretical and empirical research in this field: 1) network content refers to the nature of the content that is exchanged or flow between actors 2) governance mechanisms organize and regulate the exchange and 3) network structure refers to broader patterns created from the relationships between actors (Hoang and Antoncic, 2003). These three components emerge as key
elements in the models that seek to explain the network development process during entrepreneurial activity and the impact of networks on entrepreneurial outcomes. Because entrepreneurship research on network content, governance and structure encompasses the key dimensions of social exchange (Adler and Kwon, 2002), this work draws on the broader literature on social capital which is also concerned with the consequences of network activity on economic outcomes (Anderson, Park, and Jack, 2007; Gedajlovic, Honig, Moore, Payne, and Wright, 2013; Zahra, 2010)

Overall, we now find that the field of network-based research as a whole is richer and more complex. This suggests that we revisit and revise the conceptual categories of the original paper in order to better assess theoretical and empirical work published in the past decade. The body of work in this domain has grown to such an extent that a variety of conceptual categories have been introduced and serve as the basis for theorizing. The initial summarizing constructs of content, governance, and structure that were highlighted in the original review form a foundation for theorizing that can now be grouped into relational (content and governance) and structural constructs. More recently, work has focused on nodal constructs which reflects an interest in how characteristics that inhere in the entrepreneur, the team or the venture may be a basis for differential outcomes. Nodal constructs are conceptually distinctive from relational and structural constructs but influence network development processes in significant ways or impact the observed outcomes of networks (Phelps, Heidl, Wadwha, 2012). As we shall see, nodal constructs at multiple levels of analysis have been introduced making it readily apparent that the
field as a whole has become more theoretically and empirically rich and complex. At the broadest level of analysis, scholars are also exploring in greater detail how network processes unfold in different contexts. These broader contextual factors that are relevant to new ventures include industry-level network structure and institutional environment.

**Relational Constructs**

*Network content.* Interpersonal and interorganizational relationships are viewed as the media through which actors gain access to a variety of resources held by other actors. Hence, network content refers to the nature of the content that is exchanged or flows between them. Networks are a means of gaining access to capital including financing by angel investors and venture capitalists. Another key benefit of networks is the access they provide to information and advice. Ties to venture capitalists and professional service organizations, for example, are a means whereby entrepreneurial firms tap into key talent and market information (Freeman, 1999). A number of recent studies find that entrepreneurs form and leverage social ties to get ideas and gather information to recognize entrepreneurial opportunities (Anderson et al., 2007; Ozgen and Baron, 2007). Information and resources to internationalize can be gained from knowledgeable members of the network that can augment a firm’s own experience (Tang, 2011; Al-Laham and Souitaris, 2008). More generally, different patterns in how external and internal resources are combined have an important role in shaping firms’ subsequent growth (Rindova, Yeow, Martins, and Faraj, 2012).
Network content also encompasses how entrepreneurs can access a wide range of intangible resources. Network relations, for example, provide emotional support for entrepreneurial risk-taking (Brüderl and Preisendörfer, 1998) and this in turn is thought to enhance persistence to remain in business (Gimeno, Folta, Cooper, and Woo, 1997). Such relationships can thus involve a role-based component and an affective component leading to shared sentiments including liking, concern, and obligation that can influence observable characteristics of the relationship such as the frequency and quality of the interaction.

It has been suggested that ties to others can also facilitate the transition process related to starting a new business and becoming a founder (Hoang and Gimeno, 2010). This perspective on network content sees networks as ‘prisms’ that, by shaping their interpretation of the role in relation to other people’s expectations, can influence individuals’ adjustment to their environment. Network ties to new contacts can reinforce an emerging identity and thus may play a key role in the transition process of becoming an entrepreneur or founder. For example, Nicolaou and Birley (2003) argue that strong and dense networks ties outside the university context can support a role-identity shift increasing the likelihood that an academic will leave to start a venture. Beneficial access to role models who Kacperczyk (2013) and Nanda and Sorenson (2010) identified as those with experience starting their own business, is also facilitated by shared university or co-worker ties. Leveraging data collected across twenty European countries, Klyver, Hindle, and Meyer (2008) concluded that having entrepreneurs in one’s social network increases
the possibility of becoming an entrepreneur, although this effect varies across countries. In light of the interest by entrepreneurship scholars on the benefits of network ties it is perhaps not surprising that few studies examine how relationships may impede entrepreneurial activity (but see Kreiser, Patel, and Fiet, 2013).

However, the literature on career transitions and entrepreneurial transitions has noted that social ties that reinforce a current work role-identity can make a transition to entrepreneurship more challenging (Hoang and Gimeno, 2010).

Relationships can also have reputational or signaling content from the perspective of other network participants (Deeds, Mang, and Frandsen, 1997; Elfring and Hulsink, 2003; Higgins and Gulati, 2003; Shane and Cable, 1998; Stuart, Hoang, and Hybels, 1999). In the uncertain and dynamic conditions under which entrepreneurial activity occurs, resource holders (potential investors and employees) are likely to seek information that helps to gauge the underlying potential of a venture. Entrepreneurs seek legitimacy to reduce this perceived risk by associating with or by gaining explicit certification from well-regarded individuals and organizations. A firm’s links to prominent strategic alliance partners are associated with faster growth, measured empirically by the speed with which the firm goes public and its valuation at time of IPO. Gulati and Higgins (2003) find furthermore that the usefulness of different endorsement ties is determined by market conditions: for young biotechnology firms, ties to prominent venture capital firms are more beneficial during ‘cold’ markets when investor interest in new issues is low whereas ties to prominent underwriters have more impact on IPO success when markets are
‘hot’. These differential effects were revealed by considering the varying challenges that potential investors or strategic partners face when making their investment.

Moreover, the signaling benefits that come from holding ties to prominent organizations in different domains does not appear to be additive but instead may result in redundancy. Ozmel, Reuer and Gulati (2013) found that having redundant ties to both prominent venture capital firms and strategic alliance partners was negatively related to subsequent alliance formation.

**Multiplexity.** The layering of different types of exchange between two actors (a dyad) is termed multiplexity in network parlance. For example, ties between family members undertaking entrepreneurial activity or involved in a family firm may be best characterized as multiplex ties because they include emotional support as well as access to resources (for example, advice and labor). The study of kinship ties suggests that multiplex relations may be advantageous because they provide timely access and resources are obtained at low cost (Anderson, Jack, and Dodd, 2005). The process by which ties initiated primarily for economic exchange becomes layered with social exchange and vice versa has been the focus of a number of theoretical and qualitative studies beginning with Human and Provan (1996) who showed that relationships among firms in the network can be characterized as multiplex, involving friendship, information, and business exchange.

Having a greater number of multiplex ties may ensure that entrepreneurs can be more effective in mobilizing resources as trust and confidence are more likely to underpin such ties (Newbert and Tornikoski, 2012). However, multiplex ties may also
be sources of constraint and conflict as business demands can run counter to social obligations and expectations. Hence, contacts with more power may resist an entrepreneur’s efforts to layer business ties with social relations (Vissa, 2012). In family firms, role expectations may impede effective collaboration under different conditions (e.g. parent-child relation impedes entrepreneur-employee relation) (Aldrich and Kim, 2005). They may also limit growth when entrepreneurs seek multiple resources from the same readily available contacts but the support provided is ill-suited to the venture’s needs (Jack, 2005).

Network governance. Researchers have explored the distinctive governance mechanisms that are thought to undergird and coordinate network exchange. Trust between partners is often cited as a critical element of network exchange that in turn enhances the quality of the resource flows (Larson, 1992; Lorenzoni and Lipparini, 1999). Other scholars have also defined network governance by the reliance on “implicit and open-ended contracts” that are supported by social mechanisms, such as power and influence (Brass, 1984; Krackhardt, 1990; Thorelli, 1986) and the threat of ostracism and loss of reputation (Jones, Hesterly, and Borgatti, 1997; Portes and Sensenbrenner, 1998) rather than legal enforcement. A number of scholars have asserted that these distinctive elements of network governance can create cost advantages in comparison to coordination through market or bureaucratic mechanisms (Jarillo, 1988; Jones et al., 1997; Lipparini and Lorenzoni, 1993; Starr and MacMillan, 1990; Thorelli, 1986). In particular, mutual trust as a governance mechanism is based on the belief in the other partner’s reliability in terms of fulfillment of obligation in an
exchange (Pruitt, 1981). Trust allows both parties to assume that each will take actions that are predictable and mutually acceptable (Das and Teng, 1998; Powell, 1990; Uzzi, 1997). These expectations reduce transaction costs associated with monitoring and renegotiating the exchange, especially in highly complex tasks facing strong time constraints (Jones et al., 1997). Trust also affects the depth and richness of exchange relations, particularly with respect to the exchange of information and possibilities for knowledge spillovers in geographically bounded clusters (Hite, 2003; Lorenzoni and Lipparini, 1999; Saxenian, 1991). For example, a qualitative study of vertical relationships involving the purchase and supply of goods or services between networked firms revealed that the nature of the information exchange extends far beyond a discussion of price and quantity (Uzzi, 1997). Because of its positive impact on information flows, trusting behavior is cited as a critical factor in enhancing innovation through interfirm collaboration (Häusler, Hohn, and Lütz, 1994) and an integral reason for the longevity of networks (Lipparini and Lorenzoni, 1993; Saxenian, 1991).

Legal contracts are a formal mechanism for managing the relationships initiated by entrepreneurial firms. While understudied, they are an important foundation upon which different types of governance arrangements are built. In addition to the study of specific contractual terms (Robinson and Stuart, 2007), there is also a recognition that they vary in their complexity and differ with respect to the role of equity shareholding in the agreement. As noted by Reuer, Arino, and Mellewigt (2006) in their study of entrepreneurial firms in the German
telecommunications industry, firms with greater trust are more likely to emphasize strategic alliances over equity alliances which can result in lower coordination costs. They found that the reliance on specific contractual terms did not differ between firms who reported more and those reporting less mutual trust while search costs and the strategic importance of the relationship did increase contractual complexity.

Zahra (2010) finds that family firms with high organizational social capital (measured by items such as having a good reputation and being well connected to other firms in the industry) are more likely to have equity shareholding in new ventures launched by strangers and to hold a seat on the venture’s board. Such preferences are argued to enable greater learning and to facilitate opportunity identification and growth through weak ties. These findings are consistent with the call by Parmigiani and Rivera-Santos in their meta-review of the literature on inter-organizational collaborations (2011) to understand firms’ broader exploration/exploitation goals in order to better explain their specific governance choices.

Because new ventures and small firms tend to find themselves in positions of low bargaining power, the mechanisms whereby they are able to achieve favorable contractual terms are also of particular interest. Adegbesan and Higgins (2010) theorize about the different conditions that will lead to greater bargaining power. In their study of collaborations between new venture and incumbent firms, relative scarcity, superior complementarity, and bargaining ability are operationalized.
These measures in turn explain the extent to which new ventures were able to obtain more favorable contractual terms.

Small firms can also increase their bargaining power through the formation of associations that can negotiate in their interests. Using contract data across multiple franchise systems, Argyres and Bercovitz (2013) find that the presence of such associations are linked to more favorable terms for the franchishee including longer periods of contract duration, a shorter non-compete period should the contract be terminated, and lower overall rates of contract termination by the franchisor.

As entrepreneurial environments are dynamic and uncertain, the claims that partners make through the negotiation of specific contractual terms should the venture succeed, and through monitoring and liquidation rights when it does not, can have implications for the share of the wealth that flows to the entrepreneur (Kaplan and Strömberg, 2003). Recognizing that firms also negotiate repeatedly with partners (Ryall and Sampson, 2009), we suggest that a further study of contract design to infer bargaining power and value capture can also be facilitated by integrating relational and structural constructs.

**Network Structure.** A defining characteristic of a network perspective within entrepreneurship research is a focus on the dynamics of social structures and their impact on entrepreneurial phenomena. Network structure is defined as the pattern of direct and indirect ties between actors. A general proposition is that actors’ differential positioning within a network structure has an impact on resource flows,
and hence, on entrepreneurial outcomes. A variety of measures, drawn from the network analysis literature, have been utilized to uncover patterns within the social structure that can then be used to characterize the differential positions of entrepreneurs or their ventures in the network.

The most intuitive network measure is size. With the entrepreneur as the focus of analysis, size is typically defined as the number of direct links between a focal actor and other actors. Analyses of network size measure the extent to which resources can be accessed at the level of the entrepreneur (Aldrich and Reese, 1993; Hansen and Witkowski, 1995) and the team (Vissa and Chacar, 2009). At the firm level, network size has been equated with a firm’s alliance portfolio. A recent review of work on alliance portfolios finds some evidence that, beyond a certain size, there may be limited benefits to adding more ties and partners (Wassmer, 2010). This is due to increasing redundancy across alliances that undermines the value of the portfolio as a whole (Vassolo, Anand, and Folta, 2004). In contrast, firms may also form ties with partners who operate in different stages of the industry value chain, thus offering greater potential for complementarity rather than competitive overlap (Baum, Calabrese, and Silverman, 2000).

Typically, network-based entrepreneurship research focuses on ego networks bounded by direct ties between contacts to the entrepreneur or the entrepreneurial firm. With a whole network perspective, greater theoretical and empirical emphasis is placed on the indirect linkages that can connect the actors. A measure of network position that leverages the importance of indirect ties is centrality. While this measure
is conceptually similar to size, it explicitly includes the ability to access (or control) resources through indirect as well as direct links. Centrality taps the ability of actors to ‘‘reach’’ other actors in their network through well-connected intermediaries. Owing to the difficulty of gathering relationship data from all actors within a network, network centrality has generally been less studied than network size.

While network size and centrality measure the amount of resources that an actor can access, other patterns in the network structure influence their access to a diversity of resources. Granovetter’s (1973) notion of weak ties, in particular, describes the extent to which actors can gain access to new information and ideas through ties that lie outside of their immediate network of contacts. Weak ties serve as bridges across clusters of strongly interconnected actors. In personal networks, weak ties are typically operationalized in terms of the quality of the relationship emphasizing economic exchange over affective bonds and liking, the infrequency and short duration of the contact, and role relationship (acquaintance versus close friend) to the contact (Evald, Klyver, and Svendsen, 2006). At the organizational level, Bae, Wezel, and Koo (2011) find that cross-cutting alliances that connect different geographical regions introduce novelty and knowledge spillovers to a focal region that can in turn foster nascent entrepreneurial activity.

Complementary to the benefits of weak ties are the theorized benefits of bridging structural holes, defined as the absence of ties between actors. To observe a structural hole, there must be at least three actors (a triad) with information on the ties between them and a lack of closure (no tie) between two of the actors. By bridging
structural holes, actors can profit from establishing ties that bridge these otherwise unconnected actors (cf. Burt, 1992). Occupying a bridging position provides an opportunity to wield power, or influence those who are otherwise not connected to the broader network (Krackhardt, 1995). Given this opportunity for diverse, nonredundant contacts, spanning structural holes can also increase the focal actor’s exposure to novel information and can serve as a basis for identifying and exploiting new opportunities (Burt, 2000). When the indirect ties that connect actors are included in the analytical frame, we can assess how actors 1) come to occupy a position in the larger structure of cross-cutting ties and 2) the consequences of that position for entrepreneurial outcomes. For example, entrepreneurial firms can leverage brokerage ties to spur learning and the development of internal capabilities that ultimately enhance their performance (Baum et al., 2000; Zaheer and McEvily, 1999).

A number of studies on entrepreneurial firms have operationalized brokerage by assessing (low) network density (Burt and Raider, 2000; Zaheer and McEvily, 1999) and heterogeneity among network contacts as proxies (Baum et al., 2000; Hara and Kanai, 1994; Silverman and Baum, 2002; Zhao and Aram, 1995). Density is measured by the extent to which an actor’s contacts are interconnected, the more dense one’s network of contacts the less likely that new resources will enter. At the personal network level, a study of entrepreneurs’ membership in voluntary associations highlights that a means of countering such homogeneity may arise when entrepreneurs become members of a number of different associations. This in turn
increases the diversity of their network and decreases its density (Davis, Renzulli, and Aldrich, 2006).

Ideally, information about all actors within a given network would be used as data so that bridging ties can be more accurately identified. However the constraints of collecting such information have given rise to other methods such as the position-generator research method. This method assesses whether individuals know people within different groups (occupational or functional) so that having members of different groups in one’s network indicates high content diversity (Batjargal, 2006; Davis et al., 2006; Mosey and Wright, 2007). In another variant, Kirkels and Duysters (2010) identified a group of founders and directors of design and high-tech firms as the basis for snowball sampling over subsequent waves thereby allowing instances of brokerage to be inferred from reported connections across partners.

Summary

While we have discussed relational and structural constructs in isolated fashion, it is important to recognize their interrelatedness. This is apparent in qualitative studies of founder and venture-level network portfolios (Mosey and Wright, 2007; Siu and Bao, 2008). Hite (2003) has developed a detailed typology that considers how variation in the quality of the relationship and bases for trust may lead to different types of embeddedness. The quality of the relationships are described by a number of attributes that characterize the economic and social dimensions of the focal relationship as well as the impact of the broader network. In turn,
configurations of attributes were linked to unidimensional, bidimensional, or full embeddedness. Unidimensional embeddedness is based on only one social component (such as personal affect or friendship) and was theorized to evolve toward deeper embeddedness over time. Full embeddedness was reserved for relationships that were based on personal, economic, and network structure considerations. Bidimensional ties fell in between and included family ties because the relationships were based on trust and supporting network structures but were often not leveraged for business purposes.

This typology suggests that there is considerable variation in entrepreneurial networks that could be explained when both relational and structural constructs are taken into account. However it is a challenge to capture a wide array of information accurately and efficiently. This means that few studies capture the richness of network relationships including multiplex ties and the resulting network structures. As a result, the benefits ascribed to one or the other dimension of a network may be overstated, for example, when a multiplex tie is misidentified as a brokerage tie (Phelps et al., 2012). To fill this gap, (Coviello, 2005) introduced a multi-method approach that combines qualitative (case data) and quantitative (content analysis and network mapping) techniques in order to assess network dynamics over time. We encourage other novel combinations of research techniques that may also help to advance our understanding of the interdependencies across relational and structural constructs.
NETWORK CONSTRUCTS AS DEPENDENT VARIABLES

A significant body of social network research has emerged that attempts to account for how networks change over time and across different entrepreneurial stages. Within the domain of entrepreneurship research, the formation of new ties by individual entrepreneurs undertaking the entrepreneurial process and ties formed by entrepreneurial ventures is of prime interest because they are presumed to enable access to critical resources. Other types of network changes include tie deletion or culling that involves an explicit decision to stop investing in maintaining a relationship (Larson and Starr, 1993). The combination of tie formation and deletions has in turn implications for characteristics of a firm’s direct ties as well as the network as a whole (Koka, Madhavan, and Prescott, 2006). Finally, an established tie can be significantly reoriented or a dormant tie can be re-activated (Levin, Walter, and Murnighan, 2011). However, with the exception of Vissa (2011), where dormant ties appear as a control variable, little research has examined such instances in the entrepreneurial context.

In the original review, Hoang and Antoncic (2003) emphasized the relative paucity of research that focused on understanding network change and development. Our assessment today, based on the number and quality of studies, suggests that this imbalance has been significantly reduced and this research stream is influencing theorizing regarding the impact of networks on entrepreneurial outcomes. Slotte-Kock and Coviello (2009) noted in their own literature review that process oriented studies tend to take one of two approaches. The first approach to examining
process was focused on understanding network change that could be reflected in relevant constructs that are operationalized and measured and allow for valid inferences. For example, the size of an individual’s discussion network and the time spent developing and maintaining contacts (Greve and Salaff, 2003; Lechner, Dowling, and Welpe, 2006), reliance on strong versus weak ties (Evald et al., 2006; Jack, 2005), and reliance on family in discussing business matters (Klyver, 2007) was found to significantly vary across different phases of the start-up process and across entrepreneurs with different levels of prior entrepreneurial experience (Mosey and Wright, 2007). While measurement of these constructs would be ideally captured over time for the same individuals in a panel study design, cross-sectional study designs are often implemented. They include a variety of factors such as characteristics of the entrepreneur or characteristics of the contacts that can also explain networking behavior. An assumption is then made that these characteristics are difficult to change and thus less susceptible to the issue of reverse causality.

Another approach to process research is to explicitly study network change as a sequence or progression. In entrepreneurship research, process theory explaining a sequence or pattern is typically underpinned by a life-cycle logic, alone or in combination with a teleological, evolutionary or dialectical motor (Van de Ven and Poole, 1995). This is seen in the seminal work by Larson and Starr (1993) which relates the development of a new venture’s network as driven in part by the concrete actions of the entrepreneur in ways that are consistent with the stage of the ventures’ development. To better understand network evolution, Hite (2003, 2005) conducted
qualitative interviews and longitudinal case studies to describe how relationships may evolve over time based on the initial condition of the tie formation (termed network entry) and the interaction and forms of trust that were engendered over time (social leverage). The most common network development observed in her sample was the overlay of personal affect and liking with opportunities to gain useful referrals that “created more ties in common, increasing structural embeddedness, which increased potential for sociality (Hite 2005, pg. 128).” While less frequent, she identified how effort expended in the course of an interaction was also used as a means of generating obligations that would be paid back in the future. This is the most detailed elaboration to date of the development (or lack) of multiplex ties and the associated reinforcement with multiple bases for trust. A detailed study of a network forum explicitly created to assist business formation revealed similar developmental patterns: instrumental ties initially developed to extract benefits eventually became overlaid with affective bonds (Jack, Moult, Anderson, and Dodd, 2010).

A study conducted by Jack, Dodd, and Anderson (2008) followed three entrepreneurs in the Aberdeen region of Scotland over a 6-year time period to better understand network development processes at both the entrepreneur and firm levels of analysis. Using the work by Van de Ven and Poole (1995) to inform their theorizing, they concluded that their cases could be best understood from a combination of life cycle and teleological perspectives. A life-cycle perspective recognizes that the requirements of the venture change over the course of the venture’s formation and subsequent development and that this informs the partnering
choices that are made. Hence, interactions with the same partners across different stages of development will differ as the constraints and challenges that the venture faces will vary across the firm life-cycle.

The teleological perspective emphasizes how new tie formation and re-orientation are facilitated by goal oriented behavior. For example, qualitative study of firm networks has identified a wide range of motivations that support choices regarding network behavior including the motivation to access resources such as competitor and market information that can result in new or recurring business (Shaw, 2006) or that alter a firm’s resource profile (Hanna and Walsh, 2008) by accessing external rather than internally developed resources (Siu and Bao, 2008). Network tie formation can also be initiated with multiple firms simultaneously to create a favorable portfolio of ties that enhances a firm’s competitiveness. Ozcan and Eisenhardt (2009) find that ventures assembling complex, diverse portfolios are able to motivate and coordinate timely participation across partners based on their richer conception of the industry network, their role in its evolution, and an understanding of the interdependencies of other firms.

In another variant of a teleologically driven process theory, Vissa (2011) proposes a matching theory to explain how and why entrepreneurs form new ties for economic exchange. This theory is based on the assumption that an intention to form a new tie follows an initial contact and precedes an economic exchange being realized. An entrepreneur’s intentions to form an exchange relationship is based on an assessment of the likelihood of a successful match. Vissa (2011) found that
relational characteristics, including social similarity factors that are thought to increase trust and facilitate communication between the entrepreneur and contacts, predict both the intention to form a new tie and subsequent economic exchange between them. The perceived requirements of the business were also found to impinge on this process such that the effect of social similarity was moderated by the degree to which the profile of the new contact would advance an entrepreneur’s current business goals (for example, acquire new customer, supplier, etc.).

With the concept of networking style, Vissa (2012) characterizes founders by their tendencies toward adding new ties as well as toward how existing ties are managed. The reliance on referrals from existing ties to generate new ties is related to an individual’s preference toward network deepening actions rather than broadening actions. Vissa found that a greater (lesser) reliance on referrals to initiate new tie formation was linked to fewer (more) useful economic exchanges for the venture. In contrast, when entrepreneurs engage in more network broadening actions while undertaking few network deepening actions, the result is greater network churn. Changes in the composition of the alters in a network can in turn result in a larger portfolio of organizations for the focal venture to access (Vissa and Bhagavatula, 2012).

The benefits of greater network churn would appear to contradict the social leveraging processes that lends stability to an entrepreneur’s network as discussed in Hite (2005) but it is important to note that Vissa’s work focuses on network dynamics at the tie formation or network entry stage and covers a shorter time period (Vissa,
The emphasis on network churn is more directly comparable to work by Hallen and Eisenhardt (2012) who examine how firms initiate and convert ties for financing their venture.

**Nodal constructs: Founder characteristics.** Recent research has paid greater attention to nodal level constructs which are attributes (such as traits, motivation, and behavioral styles) that inhere in the entrepreneur or venture to explain regularities in the patterns of network change. Zott and Huy (2007) emphasize that the ability to form new ties is linked to the entrepreneur’s effectiveness in undertaking symbolic actions that bolster the personal credibility of the entrepreneurs and the legitimacy of the venture. At the interaction level, the ability to socially construct similarity by, for example, uncovering and emphasizing shared values, can facilitate the conversion of new ties to economic exchange (Phillips, Tracey, and Karra, 2013). More broadly, social construction processes that facilitate shared meaning can provide the basis for subsequent interaction with resource holders (Martens, Jennings, and Jennings, 2007).

Building on broad interest in the impact of self-monitoring as a key individual difference variable, Oh and Kilduff (2008) find that self-monitoring is linked to greater non-redundant tie formation among a sample of ethnic small business owners. Self-monitoring characterizes a tendency to alter one’s affective state and behaviors to be in line with the social context rather than to be consistent with one’s inner state and attitudes. As a result, “relative to low self-monitors, high self-monitors appear to be better at relating to different types of people and may see no need to acquaint different
types of people with each other. To the extent that people high in self-monitoring (relative to those low in self-monitoring) do ingratiate themselves into distinctly different social circles of acquaintances, the acquaintances of these acquaintances are likely to be unconnected with each other (Oh and Kilduff, 2008, pg. 1156).” We expect further work to continue that have linked a wider array of individual characteristics such as group orientation, extraversion, and neuroticism to network structure including centrality draws on studies (such as Kalish and Robins (2006) and Klein, Lim, Saltz, and Mayer (2004)). However, in a study that examines the antecedents of network size among a broader cross-section of the population (Roberts, Wilson, Fedurek, and Dunbar, 2008), age rather than personality characteristics were found to have a greater impact on network size suggesting developmental processes should not be ruled out.

Another source of variation in network behavior focuses on individual differences in social competence. Baron and Markman (2003) characterize social competence as involving adaptability to social situations and skill at impression management. They also include social expressiveness and social perceptiveness as additional dimensions that distinguish it from self-monitoring. Overall, social competence may reflect an ability that can be developed over time and contributes to differences observed across entrepreneurs in their network structure. Consistent with this, Batjargal (2010) finds that entrepreneurs’ self-reports of being effective and motivated networkers contributed to an increase in the number of structural holes or distant ties that were formed one year later.
Nodal constructs: Firms. A source of observed differences in network development has been ascribed to differences in firm capabilities or strategic orientation that supports behaviors conducive to tie formation and maintenance. Relevant organizational experience and the use of specific practices and structures—to facilitate university technology transfer for example—may be an important factor in explaining the extent to which network ties can be leveraged to support entrepreneurial activity (Lockett, Wright and Franklin, 2005). In developing their construct of collaborative network orientation, Sorenson, Folker and Brigham (2008) (CNO) generalize from the research on female managers and owners by characterizing an important difference in how entrepreneurs build and leverage relationships within and outside their organizations. CNO includes an assessment of how conflict is handled with internal and external parties and the extent to which the focal organization solicits input from key groups such as employees and family members.

Patzelt, Shepherd, Deeds, and Bradley (2008) examined entrepreneurial managers’ decision to seek a strategic alliance under different levels of firm capabilities (among other conditions) and tested whether these effects were in turn moderated by the level of financial slack. They made the case that differences in the level of financial slack across firms may dampen tie formation by decreasing the strategic motivation to turn to external partners even when high levels of internal capabilities would allow firms to benefit from such partnerships. As an illustrative finding, they found that in the conjoint analysis task, biotechnology firm managers
reported a lower preference to undertake an alliance in the case where the firm had higher levels of scientific talent and this effect was still lower for firms holding high levels of financial slack.

Nodal constructs: Team characteristics. Between the firm and founder level is the study of entrepreneurial teams from a network perspective. There is a smaller body of empirical studies at the entrepreneurial team level that is often focused on ventures that pursue technologically driven, high-growth opportunities (Neergaard, 2005). In the case of academic spin-offs where such conditions typically apply (Nicolaou and Birley, 2003), the completeness of spin-off teams as represented by the diversity of the functional skills and the degree of role articulation has been linked to the networking behavior of founding teams (Grandi and Grimaldi, 2003). Li (2013) examined team size and diversity, captured by the extent of non-overlapping prior organizational affiliations, to explain the formation of multi-party alliances. Similarly, relational and structural characteristics of new ventures’ board member ties that promoted range and diversity helped to explain early patterns of alliance formation resulting in diverse alliance portfolios (Beckman, Schoonhoven, Rottner, and Kim, 2014).

A focus on the team and board of director’s level may provide important specifics to the broad observed patterns regarding the culling and transformation of a firm’s portfolio of ties over the venture development process. A number of scholars argue that as the venture grows, the network management task does too, driven in part by the growing multiplexity of relationships and the increasing demands by a firm’s
contacts (Steier and Greenwood, 2000). A qualitative inductive study of low versus high performing biotechnology ventures revealed that key elements of how networks were managed across the founding team allowed for greater adaptability. Specifically, teams that became more specialized in managing their relationships to key constituencies were able to reduce the relational and cognitive overload and increase their capacity to form diverse firm-level ties (Maurer and Ebers, 2006).

Network specialization in turn requires greater internal integration within the team to facilitate coordinated action. In their performance oriented studies, Vissa and Chacar (2009) and Brinckmann and Hoegl (2011) confirmed the importance of team processes as captured by team’s degree of communication and cohesion through survey based measures.

**Summary**

While earlier work focused on network formation, recent research has broadened to include other forms of network change and development. In particular, researchers have combined a venture life-cycle perspective with a teleological or goal-oriented logic to explain the motives and process underpinning different forms of network change. Network churn remains a promising subject of examination and further work can examine the extent to which venture stage influences the processes, its benefits, and its potential downsides. Our understanding of how multiplex relations develop across different stages of the venture life cycle and across different
types of ventures also remains limited. Recognizing the importance of multiplexity, future research could also begin to address the tensions in network tie development by exploring contradictions and conflict that can emerge in the layering process of different types of relations.

The body of research that focuses on network development at the team and board of director’s level is small compared to the work at the founder and firm level. The team remains a critical unit of network formation behavior which may contribute to the culling and transformation of a firm’s portfolio of ties over time. A focus on different units of analysis may lead to insights on how actors can gain information and resources from those further away in the network structure. As barriers, Aldrich and Kim (2007) note the predilection of individuals to form ties to similar others, the greater costs of bridging different social worlds, and the challenge of “seeing” the larger social structure as barriers to change. Thus there is an interest in understanding how teams can overcome such limitations by facilitating greater network diversity and supporting the challenging task of managing different types of relationships.

However, our discussion of teams does not end with a call for further research. As we shall see, the impact of nodal constructs at all levels of analysis is being explored in outcome oriented research and underscores multiple points of intersection between research on ‘Network Constructs as the Dependent Variables’ and ‘Network Constructs as the Independent Variables’. This suggests that there are further opportunities for research that come from the continued cross-fertilization of these two research streams.
NETWORK CONSTRUCTS AS INDEPENDENT VARIABLES

Network constructs have been employed as the critical variables in explaining the achievement of important entrepreneurial milestones, including developing a business plan, gaining customers, and mobilizing resources. Hence, this body of work sheds light on critical processes of opportunity discovery, resource acquisition, and legitimacy establishment (Elfring and Hulsink, 2003). As a result, this research stream has significant implications for entrepreneurs, educators, and policy-makers.

The body of work that links networks and performance is diverse, as there are various direct and indirect proxies. For example, scholars have sought to explain entrepreneurial outcomes after foundings by examining new product development performance. It serves as a leading indicator that can portend future success (Haeussler, Patzelt, and Zahra, 2012; Rothaermel and Deeds, 2006; Soh, 2003). There is also interest in financial and non-financial indicators such as revenue, profit and employee growth. Over a longer period of time, firm survival or dissolution becomes a relevant indicator and has also been assessed directly. The variety of indicators employed raises challenges to generalizing across different studies but this reflects real world complexity better and is more conservative in light of the lack of empirical evidence for a view of performance as a latent construct (Glick, Washburn, and Miller, 2013). Hence, our review of work wherein network constructs serve as
the independent variable considers a variety of milestones and financial performance metrics as outcomes. Similar to the review of network process research, we focus on the various constructs (relational, structural, nodal, and contextual) that have been invoked in theory and empirical work published since the 2003 review paper.

Milestone Achievement Including Financing

Because financing represents an important milestone and a specific type of dyadic relationship (in particular with venture capital firms), the study of financing ties can serve as a bridge between the ‘Network Constructs as Dependent Variables’ and ‘Network Constructs as Independent Variables’ research streams.

Relational and structural constructs. Receiving venture financing underscores the strategic, dynamic, and heterogeneous nature of tie formation. Financing, especially from venture capital firms and established companies, is an important element for success in firms with high growth potential that requires lengthy periods of development before gaining revenues. A number of studies highlight that the formation of financing ties significantly broadens a venture’s network and contributes to its diversity of ties. To explain it, scholars have differentiated between ties formed on the basis of pre-existing personal ties, via referrals or by contacting an investor directly (Hallen, 2008; Zhang, Souitaris, Soh, and Wong, 2008). Hallen (2008) found that founders’ existing ties and human capital predicts the likelihood of tie formation between a new venture and its potential partners. In a survey of young, high tech ventures in Singapore and Beijing, Zhang et al. (2008) found that, while the
decision to use personal ties to connect to venture capitalists was the dominant choice, entrepreneurs with managerial and marketing experience were choosing to approach them directly, perhaps due to their greater social competence.

Batjargal and Liu (2004) examine venture capital financing in the Chinese context and find that investors are not swayed to invest on the basis of relationships. Yet they do find that the time length of the negotiations were longer and subsequent terms of the deal were more favorable to the socially connected entrepreneur. Hallen and Eisenhardt (2012) also stress the benefits to the entrepreneur of using prior direct ties but, in the absence of such ties, they elaborate on a number of strategic actions that are used to reduce the time and effort it takes to form investment ties. With the construct of formation efficiency, they also suggest that efficient tie formation better conceptualizes the source of high-performance network outcomes. They note some founders using information obtained through the network or through direct interaction are able to effectively form and then cull initial contacts to retain those most likely to commit to funding the venture.

While obtaining finance is important, achievement of a broad array of milestones is needed to create an organization. Hence the study of nascent entrepreneurs has been a domain of ongoing interest to researchers who seek to understand the impact of social ties. In a research design that brings network processes directly into the analytical frame, Newbert and Torniskoski (2012) have leveraged the longitudinal research design of a nationally representative sample of US nascents and their ability to achieve key milestones by obtaining the first sale and
hiring an employee or obtaining finance. They found that achievement of these milestones was more likely to result from larger networks as well as higher initial levels of multiplex ties. In a subsequent study from the same population, Newbert, Tornikoski, and Quigley (2013) find that growing heterogeneity in nascents’ network of contacts was linked to self-reports of establishing a new venture and reaching positive cash flows. These findings, which are echoed in work at the team and firm level, suggest that heterogeneity across ties can reduce problems associated with over- and under-embeddedness. In addition, comparisons between those who succeeded and those who did not indicate that the rate at which these networks become more heterogeneous has a significant impact on the final outcome.

While network ties bring beneficial results to new ventures by facilitating resource and information flow, it should be noted that initiating and maintaining them requires considerable resource input both for the firm and for the entrepreneur. A number of research articles uncovered a diminishing return on investment in network with regard to firm performance. That is, the relationship between networking and outcomes may not be linear, and excessive investment in creating or maintaining network may not improve firm performance. Semrau and Werner (2013) consider entrepreneurs’ network characteristics, measured by network size and relationship quality, and their impact on performance, as measured by access to knowledge and information, financial capital and additional business contacts. The latter resources were more difficult to obtain when network size and relationship quality was low. Hence, different types of resource are acquired at different “costs” in terms of time
Semrau and Werner (2012) provided evidence on the inverted-U relationship between nascent entrepreneur’s investment in relationship quality and success of new venture creation. Moreover, the impact of network size was positive although with declining marginal benefit.

Recent research suggests that network changes undertaken in the nascent process may have significant negative consequences. Kim, Longest, and Aldrich, (2009) find that poor matching of resources to roles (for example, seeking business advice and information from family and friends who are more suited to providing social support) may impede or slow down the completion of tasks necessary for establishing a venture. In their hazard-rate model predicting entrepreneurial persistence, Kim et al. (2009) find that the benefits of initial network size becomes insignificant, indicating a mediation effect, after resources obtained from aligned and non-aligned sources are introduced in the model. This study underscores potential downsides to promoting multiplexity (in contrast to growing the network by adding new ties) in order to increase the diversity of resources.

**Nodal characteristics.** Multiplexity and other network dimensions can contribute to heterogeneity in the resources accessed and are found to be particularly relevant to achievements in the nascent stage. The different types of behaviors that lead to such diversity have been the focus of scholars examining network dynamics but questions remain as to how such heterogeneity is managed. Building on the work of Baron and Markman (2003), Kreiser et al. (2013) examine the nascent stage and argue that characteristics of the founder, namely their social competence and
entrepreneurial intensity are important factors. Entrepreneurs with greater entrepreneurial intensity, defined as having the motivation and commitment to become an entrepreneur, are better able to limit the costs of growing tie strength as captured by multiplexity. They are able to convince contacts to share more valuable or tacit resources as a result of their commitment to being a founder. Kreiser et al. (2013) also find that those with higher social competence are better at leveraging the growth in their network in ways that facilitate an increase in firm founding activities.

**Venture Financial Performance**

*Relational Characteristics.* Firm financial performance is an often utilized basis for gauging the success of a venture. Because absolute levels of financial performance may be low, scholars have tended to emphasize growth rates in terms of revenues and profits over a period of time to be more relevant for new ventures. Hoang and Antoncic (2003) have cited research evidence underscoring the benefit of network ties on ventures’ financial performance. Recent work has added considerable nuance to this, including how network effects are shaped by environmental contingencies. Watson (2007) found that different types of networking behavior affect different performance indicators: in terms of firm survival, network intensity or the frequency with which formal and informal networks were leveraged was found to be more important than network range. In contrast, network range as an indicator of the breadth of resources tapped was found to be more important in facilitating firm revenue growth. Echoing work at the nascent stage,
these relationships were nonlinear so that high levels of intensity and range negatively affected performance outcomes.

Baum and Silverman (2004) find that ties to other firms occupying the same position in the industry value chain increased a firm’s ability to access venture capital funding but these ties were found to lead to lower levels of revenue and a higher likelihood of failure. In contrast to the potentially stronger competitive effects exerted by horizontal ties, they found that alliances with complementary (downstream) firms were more consistently beneficial by increasing revenues and lowering failure rates.

Recent research evidence points out a contingency of firm’s stage of development on the relative value of each type of network. For instance, reputational networks at the founding stage significantly reduce firms’ time-to-break-even, while social network ties have no direct effect (Lechner et al., 2006). The relational mix emphasizing different types of ties (for example, marketing, reputational, and social ties) are important at different stages of development and thus must change with a firm’s development or else they become a barrier to growth (Lechner and Dowling, 2003; Lechner et al., 2006). Sheng, Zhou, and Li (2011) identify broader environmental conditions as a contingency. They argue that in emerging economies, such as China, business ties are more strongly related to venture performance than political ties, and the effects of both types of ties are contingent upon institutional and market conditions.
Structural Characteristics. There is continued interest in the impact of network structure on different critical entrepreneurial processes since Burt’s (1992) work on the performance benefits of structural holes. One recent study finds that the structural holes within a team’s external network positively affects performance outcomes (Vissa and Chacar, 2009), and this effect is moderated by greater strategic consensus and cohesiveness within the team. Therefore, not only individual entrepreneurs, but entrepreneurial teams, benefit from a network structure with more structural holes.

The debate on the relative benefits of brokerage versus cohesion continues as recent work has also found that cohesion can enhance performance. Echols and Tsai (2005) found that firms with distinctive products and operational processes (product and process niche) benefit from a high level of network embeddedness, as it provides a richer social context containing useful information and resource flows which enables the firm to better exploit its position. New ventures can also be perceived as more valuable to partners when they can connect diverse but interdependent firms together and facilitate coordinated action (Ozcan and Eisenhardt, 2009). Yu, Gilbert, and Oviatt (2011) found that greater cohesion rather than structural holes increased the speed with which firms achieved their first international sales. They argued that the market knowledge shared by a firm’s internationally experienced, foreign partners would remain relevant for a longer period of time thus increasing the benefits of rich information exchange relative to the demand for novel information.
Nodal characteristics: Founders. Recent research has focused on nodal level constructs or characteristics that lead to desirable financial performance. To date, the majority of such empirical research examines the impact of individual-level nodal attributes, that is, personal characteristics of the founder that are related to network initiation and maintenance. It is argued that individual characteristics of the entrepreneurs influence their networking behavior and subsequent venture performance. The entrepreneur’s social skills and social competence can be strong predictors of venture success to the extent that it is mediated by the entrepreneur’s success in obtaining information and essential resources (Baron and Markman, 2003; Baron and Tang, 2009).

More recently, a focus on individual-level characteristics has emphasized that some seemingly desirable personal characteristics do not always result in positive financial outcomes through networking. Building on the work of Vallerand et al (2003), entrepreneurial passion is conceptualized as the positive emotions that an entrepreneur has for entrepreneurial work (Ho and Pollack, 2014). While passion for one’s entrepreneurial work is believed to be beneficial to overall entrepreneurial success (Baron, 2008), Ho and Pollack (2014) argued and demonstrated that different types of passion (harmonious and obsessive) influence network centrality, which in turn lead to varying levels of financial performance. Specifically, harmoniously passionate entrepreneurs are those who seek to develop personal competence and task mastery, and they are more motivated to reach out and seek help from others. On the other hand, obsessively passionate entrepreneurs are more motivated to demonstrate
their superior competence and performance or to avoid negative judgments. These individuals are more reluctant to seek help from others, and their emotional defensiveness prevents them from being approached by others. As a result, different types of entrepreneurial passion can explain the entrepreneur’s actions in a network, as well as the consequences for performance.

**Nodal characteristics: Teams.** Although the network of the founder can determine firm growth, firm networks need to be actively managed. At the team level, the social competence of the team is argued to lead to new firm growth. Brinckmann and Hoegl (2011) empirically traced the relationship between team level characteristics and firm-level performance. Initial relational capabilities of team members can foster resource acquisition by effectively and efficiently managing the exchange with its environment. The quality of collaboration of the entrepreneurial team with external partners was shown to have positive effects on firm growth, characterized by additions of team members, employment growth, and sales. This work complements firm-level research which postulates related constructs. However, the examination of collective-level nodal attributes of the team, as suggested by Witt (2004), provides an important cross-level perspective within entrepreneurial network research. More research is thus needed to determine what and how team-level nodal characteristics impact firm or network performance.

**Nodal characteristics: Firms.** Properties of the firm can both directly and indirectly affect venture performance. A study of university spin-offs (Walter, Auer, and Ritter, 2006) showed that a firm’s networking capability (NC) positively relates
to its performance as measured by sales growth. Network capability was captured by four factors: coordination, relational skills, partner specific knowledge, and internal communication. Similarly, Sorensen, Folker and Brigham (2008) linked their construct of collaborative network orientation to self-reported measures of success among a sample of small, family-owned businesses. They found that firms characterized by greater CNO reported higher levels of success and that this effect was higher for male-owned businesses than for female-owned businesses.

Viewed over time, the extent of a firm’s collaborative activity is thought to contribute to its experience and knowledge in that domain. Hence, an important consideration in explaining the extent to which a firm’s current network ties can be leveraged is to consider the extent of a firm’s alliance experience. In their study of R&D collaborations, Hoang and Rothaermel (2005) find that the extent of general alliance experience defined as the knowledge gained from selecting, negotiating, and managing collaborative relationships can enhance new venture success. In addition, the extent of prior ties with a focal partner increases the firm’s partner-specific experience which was also found to contribute to collaborative success.

**Contextual factors.** In addition to relational, structural and nodal attributes, important contextual conditions may explain variation in firms’ financial performance (Gedajlovic et al., 2013). These contextual factors, such as industry munificence and variation in cultural and institutional contexts have been studied as moderators between various entrepreneurial activities and firm performance (for example, Brass, Galaskiewicz, Greve, and Tsai, 2004; Klyver et al., 2008; Sigmund, Semrau, and

Rosenkopf and Schilling (2007) examine factors that may explain differences in alliance participation and the resulting structural network patterns across industries. In addition to graphic representation by mapping the networks, they summarized differences with network statistics, including the small world statistic that identifies the extent of clustering compared to what might be expected in a similar randomly generated network. Clustering is evident when firms in a network tend to have partners that are also partnered with each other. Observed differences across industries such as between pharmaceutical and communication equipment sectors were linked to the need to cope with dynamism or pace of change in the underlying technology as well as uncertainty with regard to the direction of change. The extent of firm-level collaboration is also likely to be influenced by the underlying architecture of the technology platform and the extent of modularity between the technology’s subcomponents. Open rather than closed technology platforms and high levels of modularity create more opportunities for entrepreneurial ventures leading to higher rates of collaboration. Rosenkopf and Shilling’s insights suggest that technological dynamism and industry/technology life cycle considerations may be relevant factors that impinge on firm performance outcomes.

Clarysee, Bruneel, and Wright (2011) conceptualize environmental complexity and environmental stability as critical features. Complexity describes how incumbents may control important complementary assets and access to
customers increasing the need for ventures to initiate partnerships. They characterize stability as the extent to which the new venture will be able to appropriate the returns from their distinctive resources. They generate propositions based on case studies of new ventures that highlight how ventures should use partnerships to emphasize either technical or commercial access under different environmental conditions. Their work suggests that these conditions have implications for the scope of partnership choices and alliance portfolio structure which in turn affects subsequent firm-level performance.

A firm’s environment encompasses formal institutional actors including governments who seek to shape the regulations, policies, and practices by which firms compete. Attention to these factors and their impact on entrepreneurial activity has long been central to research on academic entrepreneurship and university spin-outs (see, for example, the review by Djokovic and Souiteris, 2008). In order to understand the impact of the institutional environment, researchers have also leveraged the construct of institutional polycentrism, which denotes spontaneous interactions of multiple institutional rules and norms, and mutual adjustments among institutional actors. Batjargal et al (2013) studied how the confluence of multiple institutions (political, regulatory, and economic) affected entrepreneurs’ networks and new venture revenue growth. They posited that the confluence of weak and inefficient institutions contributes to the development of structural holes, and positively moderates the relationship between entrepreneurs’ structural holes and revenue
growth. A study of entrepreneurs and their ego networks in China, Russia, United States, and France was supportive of their hypotheses.

Summary

The stream of research that examines the effect of network-related variables on venture performance has been abundant and has yielded considerable results at both the individual and the firm level. While the social networks of entrepreneurs and entrepreneurial firms are generally considered to contribute to firm growth, financial performance and milestone achievements, there are several issues that researchers could examine further. First, what are the negative consequences of diverse or multiplex network ties? Kim, Longest, and Aldrich (2009) have suggested that the network itself may be insufficient to bring critical information or resources to entrepreneurs. A poor task-role alignment may result in inefficient resource exchange. If there are negative consequences, it would be important to understand how their effects may vary in degree across different outcomes. Second, the utility of certain types of network ties may vary according to the venture stage. This raises the question of how founders actively manage their network configuration across stages of venture development especially during periods of rapid change. Third, the role of the venture team can be explicitly studied as a contributing factor to venture-level outcomes. Finally, researchers should not neglect the power of the context in which network variables impact venture performance. Institutional, cultural, and technological conditions should be included in future research in order to provide a more comprehensive picture of the role of entrepreneurial network.
Cross-cultural comparisons that uncover network effects in emergent markets are especially needed given the current global context of entrepreneurship.

DISCUSSION AND CONCLUSION

The primary goal of this review is to summarize network-based research to consolidate findings that emerge across studies and to identify new areas for further research. With over 80 studies published in the last decade detailed in this review, it is clear that this research area continues to flourish. (See Table 1 for a summary of our construct definitions, key findings and recommendations for future research). Moreover, understudied areas and issues that were identified in the 2003 literature review have now received greater attention. For example, entrepreneurial actions that underpin tie formation and tie culling have been revealed in a number of qualitative studies. They highlight that such dynamics are goal-oriented (for example in the search for funding) and can involve skillful and concerted efforts by the entrepreneur. Overall, work on the entrepreneurial process that has been published in the last decade begins to redress the imbalance that threatened to lead to simplistic conceptions of network structure and its relationship to entrepreneurial outcomes.

In the last decade, researchers have broadened their conception of the resources that are exchanged or transferred via social relations. This is in part due to more detailed conceptions of the milestones that can be achieved during the
entrepreneurial process. We are also better at accounting for multiplexity within a relationship which in turn gives insight into developmental sequences for social relationships. When roles are explicitly included and networks are viewed in terms of their relational and structural characteristics, additional sources of redundancy and misfit emerge, which may hinder the venture founding process. Although the picture remains incomplete, we are increasing our understanding of whether and how founders manage the trade-offs of different network configurations. A more complex picture is emerging that suggests that some aspects of networks may contribute to better performance along some dimensions but not others (for example, survival versus growth).

Qualitative and longitudinal research designs have contributed to a more detailed understanding of tie formation and the leveraging process that can lead to resource acquisition and deployment. In contrast, the dynamics of how existing, strong ties are re-oriented effectively is not understood as well. This may, in part, be due to the lack of studies that focus on the impact of rapid growth on network development processes. This would suggest that further study is needed of the period of time after receiving external funding. We know relatively little about how entrepreneurs and teams may change their network configurations under such circumstances and the extent to which contacts may be more or less resistant to tie redefinition. When established ties are reconfigured rather than left to go dormant, what are the consequences and how do founders view the trade-offs? The network configurations that we study are based on active ties, but this may understate the
potential for network reconfiguration as we have ignored the impact of reviving
dormant or latent ties. Reactivating dormant ties has not been systematically
examined as a means of expanding resources and may present its own set of
challenges. Overall, as our view of optimal network configurations becomes more
nuanced due to a better specification of the challenges and relevant milestones that are
achieved at different developmental stages, understanding the dynamics of network
reconfiguration will become more urgent.

To facilitate future research, a number of scholars have proposed that our
research methodologies explicitly combine multiple methods in the same research
project. To better assess relational and structural features of networks, combining
qualitative and quantitative techniques will be particularly helpful. An in-depth
study of a select number of cases providing information on timing and order of
actions and events can be combined with the collection of network data, thus allowing
for cross-level process insights. For example, using a combination of qualitative and
network mapping and visualization, Coviello (2005) was able to characterize changes
in network structure, identify instances of tie deletion (short-term versus long-term
ties) and, with a longitudinal research design, provide some insight into the
consequences of declining network centrality.

The past decade of network-based research yielded a number of factors at the
individual, team, and firm level that contribute to network development. Due, in
part, to a long standing interest in the nascent stage of the entrepreneurial process, the
impact of personal characteristics such as social competence and networking ability
has received scholarly attention. Moreover, different networking styles have been proposed that shows that entrepreneurs have preferences in the way that direct ties are initiated and maintained. Correlational evidence provided by Vissa (2012) suggests that networking styles may be related to certain personality characteristics which are viewed as more enduring. Nevertheless, it would be fruitful to investigate the malleability of these competencies and preferences by examining the factors that facilitate their development.

Because it may serve as a bridge to understanding firm level outcomes, more studies at the team or group level are needed. Such work can yield insight on how dynamics at the group level modify the impact of lower level constructs. Our conception of effective network configuration at the individual level for example may change when examining a team’s network configuration. In a study of nascent entrepreneurs, it appears that entrepreneurial team formation is typically based on prior familial or friendship ties and exhibit low professional diversity thus suggesting that there will be obstacles in reaching new social space in the network (Ruef, Aldrich, Carter, 2003). However, at the group level, it may not be necessary for all team members to have diverse ties and there may be advantages to having some team members with dense networks. This may allow for greater focus and specialization in domains that emphasize exploitation while allowing other team members to emphasize exploration. In general, better understanding of team-level dynamics should take into account how these group processes are occurring in dynamic and uncertain contexts.
To provide a foundation for comparison and discussion across studies, researchers must make clear how the relevant group boundary is determined and the roles that members play in the team. Where to draw boundaries is always an important issue but recent studies also highlight the need to account for changes in group boundaries that may include board members and key employees. A clear delineation of boundaries can serve to better conceptually integrate different studies including the study of family firms. Typically in family firm research, the team is defined by family ties but this may ignore important interactions. The study of teams that are mixed or comprised of family and non-family members can shed new light on network development processes including the causes and consequences of multiplexity and tie re-orientation. Leveraging network constructs may in turn provide a useful lens from which to answer core questions of family business researchers.

The impact of founder’s network ties and intensity of networking activity has been shown to have a positive impact on measures of firm performance. However, recent work suggests that there is declining marginal impact as the number of ties or networking activity increases. An assumption of ten made is that lower level network attributes of the founder adequately describe a firm’s network attributes or position. Hence it is interesting to note that within-level research that focuses explicitly on interorganizational alliances has been inconclusive with respect to the presence of a nonlinear relationship between alliance portfolio size and firm performance. However, this measure fails to capture the relevant trade-offs that may result in a nonlinear relationship. Hence additional characteristics of the alliance
portfolio including the number of different partners and proportion of repeat partners should be taken into account. Inclusion of such measures can help to differentiate between potential mechanisms underpinning a declining marginal effect such as limits to a firm’s general alliance versus limitations to its partner-specific experience.

We have noted that firm-level constructs are also frequently examined as a moderator in models that seek to explain venture financial performance. For instance, at the nodal level, firm size or age moderates the extent to which lower level network attributes will influence higher level performance outcomes. Strategy scholars have in turn begun to introduce firm level network characteristics as moderators, indicating that the relationship between network constructs and venture performance need not always be direct. Exploring the interaction of relational and structural network properties can also provide further insight into the sources of heterogeneity in venture performance. The result is that theoretical integration across diverse studies and empirical models will become more difficult in the future. We therefore urge scholars to facilitate this process by continuing to be clear in their definitions of key constructs and strive for consistency in their measurement across studies.

As the community of entrepreneurship scholars grows, it is perhaps not surprising that scholars are asking how different institutional and political environments may shape network development processes and their resulting outcomes. In order to facilitate entrepreneurial activity, organizations are being created under the aegis of local and national governments to facilitate network
formation among new ventures and small firms. These firms are also self-organizing into voluntary associations. A focus on such organizations may be a promising basis for comparative institutional research. That is, researching the variation in their mandate and mode of operation may shed light on how institutional context shapes the formation of entrepreneurial networks. Overall, the potential for cross-level insights can be increased as we focus on key actors that can provide insights into the interrelationships between lower and higher levels of analysis (for example, teams and voluntary organizations).

Because scholars study network constructs as both independent and dependent variables, the question is raised whether we can ever get a clear assessment of the impact of networks on performance when networks are not exogenous to the processes that generate the observed outcomes. While such issues are challenging to disentangle empirically, it is clear that a cross-sectional research design is least likely to offer remedial measures that can bolster causal claims. Indeed, the cross-sectional design introduces other sources of bias if network effects decay or their magnitude changes through the course of new venture development. Hence, longitudinal designs are needed in order to have a more complete picture of how networks influence firm performance.

Ultimately, we see the link between process and outcome-oriented work as highly complementary because insights in one stream can inform or result in new questions that can be addressed within the other stream. However there are limits to what any one study can account for and conceptual weaknesses may be introduced if
the scope of a single study becomes too wide. With these caveats in mind, we encourage greater methodological sophistication by broadening the scope of future work to include multiple levels of analysis and to explicitly incorporate multiple empirical methods. This way, scholars will be better equipped to capture the wide range of constructs at different levels of analysis that are now being incorporated into theoretical models of networks. We would argue that such studies are also well positioned to advance our understanding of the role and consequences of networks in the entrepreneurial process.

In conclusion, our review indicates that there continues to be a strong interest in a network-based perspective to entrepreneurship. Greater attention to variation in network processes and outcomes suggests that the conceptual and empirical bases of this field are becoming more rich and complex. We defined the core relational and structural constructs and summarized a growing body of work that integrates nodal and contextual constructs into the analytical frame at multiple levels of analysis. It is our hope that this review effectively captures this richness and complexity while organizing this growing literature in ways that identify potential avenues for future research.
### Table 1

**Key Findings and Suggestions for Future Research**

<table>
<thead>
<tr>
<th>Construct definition</th>
<th>Relational</th>
<th>Structural</th>
<th>Nodal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>The nature of the content that is exchanged or flow between actors, including both tangible (capital) and intangible resources (access to information and advice, emotional support, legitimacy signals), or the layering of multiple resources (multiplexity). Mechanisms which organize and regulate network exchange, including contracts and trust between partners.</td>
<td>Pattern of direct and indirect ties between actors, at both individual and organizational level, measured by network size, centrality, density, strong/weak, bridging ties.</td>
<td>Characteristics that inhere in the entrepreneur, team or venture as basis for differential outcomes; distinctive factors that do not depend solely on relational processes for their development.</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recommendations</strong></td>
<td>Further explore the process of development of multiplex ties; further explore network churn.</td>
<td>Explore tie deletion and tie-reorientation including revival of dormant ties.</td>
<td>The link between individual and team-level network processes can be further explored.</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Explore formal contracting in asymmetric power situations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Network as IV</strong></td>
<td>Pre-existing ties predict future financial tie formation through strategic actions; multiplex ties help achieve milestone event; resource-role matching increases support received from network; relational mix: different types of ties are important at different stages.</td>
<td>Growth in network size and heterogeneity help achieve milestone events; initiating and maintaining network has opportunity cost and may result in diminishing or even negative marginal return; cohesion and structural holes are both demonstrated to enhance performance.</td>
<td>Founder. Founders’ social skills and social competence help obtain information and resource from network; different types of entrepreneurial passion lead to varying levels of financial performance through different degrees of centrality.</td>
</tr>
<tr>
<td><strong>Key findings</strong></td>
<td>Pre-existing ties predict future financial tie formation through strategic actions; multiplex ties help achieve milestone event; resource-role matching increases support received from network; relational mix: different types of ties are important at different stages.</td>
<td>Growth in network size and heterogeneity help achieve milestone events; initiating and maintaining network has opportunity cost and may result in diminishing or even negative marginal return; cohesion and structural holes are both demonstrated to enhance performance.</td>
<td>Founder. Founders’ social skills and social competence help obtain information and resource from network; different types of entrepreneurial passion lead to varying levels of financial performance through different degrees of centrality.</td>
</tr>
<tr>
<td></td>
<td>Founder.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team. Social competence of the</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
entrepreneurial team leads to new firm growth.
Firms’ networking capability enhances performance.

| Recommendations | Potential downside of multiplexity: poor task-role alignment? How to balance the tradeoffs between network diversity and efficiency. How do ventures manage their relational mix according to their needs? | Explore contingencies that illuminate when cohesion versus brokerage facilitate outcomes; delineating tradeoffs of network advantage across different outcomes. Examine how entrepreneurs network configurations change across stages of development. | Assess impact of context including institutional, cultural, and technological conditions. Cross-cultural comparison including network effects in emergent market. |

| Integrating issues and methods across research streams | Recommendations | Clarify how venture life-cycle stage and development affect network development or outcomes; delineate strategies for actively managing relational/structural characteristics of network; more exploration of contextual factors (e.g. institutional and technological). |
References


