Network-based research in entrepreneurship
A critical review

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Abstract

Network-based research in entrepreneurship is reviewed and critically examined in three areas: content of network relationships, governance, and structure. Research on the impact of network structure on venture performance has yielded a number of important findings. In contrast, fewer process-oriented studies have been conducted and only partial empirical confirmation exists for a theory of network development. In order to address unanswered questions on how network content, governance, and structure emerge over time, more longitudinal and qualitative work is needed. Theory building in this field would benefit also from a greater integration between process- and outcome-oriented research.

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1. Executive summary

Approximately 15 years ago, research on networks emerged as an important new area of inquiry within the field of entrepreneurship. Reflecting on the various definitions of entrepreneurship that exist in the field, we decided to search entrepreneurship, sociology, and strategic management journals for papers on the role of networks in the entrepreneurial context. Our research revealed that over 70 papers on this topic have been published in the
past 15 years. 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. Given the large body of accumulated research, this is a particularly appropriate time to review the work conducted thus far.

To be of value to the broadest audience, including those who are new to the area, we have written our review to be both integrative and critical. To achieve the former, we organized the literature by defining and illustrating the three essential components of networks: the content of the relationships; the governance of these relationships; and the structure or pattern that emerges from the crosscutting ties. These three components emerge as key elements in models that seek to explain the process of network development during entrepreneurial activity and the impact of networks on entrepreneurial outcomes. Our critical assessment and discussion of the theoretical and empirical work is based on a general review of these constructs.

With regard to 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. A key benefit of networks for the entrepreneurial process is the access they provide to information and advice. The reliance on networks is not constrained to the start-up stage. Entrepreneurs continue to rely on networks for business information, advice, and problem solving, with some contacts providing multiple resources. Relationships can also have reputational or signaling content. 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. Positive perceptions based on a firm’s network linkages may in turn lead to subsequent beneficial resource exchanges.

The second construct that researchers have explored is the distinctive governance mechanisms that are thought to undergird and coordinate network exchange. Trust between partners is often cited as a critical element that in turn enhances the quality of the resource flows. Network governance can also be characterized by the reliance on “implicit and open-ended contracts” that are supported by social mechanisms—such as power and influence, and the threat of ostracism and loss of reputation—rather than legal enforcement. These elements of network governance can create cost advantages in comparison to coordination through market or bureaucratic mechanisms.

The third construct is network structure, defined as the pattern of relationships that are engendered from the direct and indirect ties between actors. A general proposition guiding the focus on network structure is that differential network positioning has an important impact on resource flows, and hence, on entrepreneurial outcomes. In order to generate a comprehensive picture of the differential positions of entrepreneurs or their ventures in networks, a variety of measures, drawn from the network analysis literature, can be used. In addition, whereas network size and centrality delimit the amount of resources an actor can access, the presence of structural holes in the network challenges the ability of actors to gain access to a diversity of resources.

From our review, we noted two broad trends in the research conducted thus far. First, research on the impact of networks on entrepreneurial outcomes, and in particular, new
venture performance, has been very productive, yielding a number of important findings. Second, fewer process-oriented studies, where networks are the dependent variable, have been conducted and only partial empirical confirmation exists for a theory of network development. Many questions remain regarding how network content, governance, and structure emerge and develop over time. To support this initiative, more longitudinal and qualitative work is required. Theory building in this field would benefit from a greater integration between process- and outcome-oriented research. Supported by multimethod and qualitative research designs, the result would be richer and more dynamic theories within the entrepreneurial context.

2. Introduction

Approximately 15 years ago, an important new area of research within the field of entrepreneurship emerged. Drawing on a broader revitalization of the field of economic sociology, scholars began to question the widely held view that entrepreneurs, as economic actors, were isolated and that the entrepreneurial process was distinct from other social phenomena. Instead, entrepreneurs were seen as intimately tied, through their social relationships, to a broader network of actors. It became the task of scholars to examine the causes and consequences of embeddedness in the entrepreneurial process.

Our literature search of entrepreneurship, sociology, and strategic management journals reveals that over 70 papers have been subsequently published on the role of networks in the entrepreneurial context. 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. While it is broad, such a definition of the field is consistent with that adopted by the Entrepreneurship Division of the Academy of Management.

Given the large body of accumulated research, now is a particularly appropriate time to review the work conducted thus far. To date, a brief review of network research in the area of entrepreneurship can be found in the work of Araujo and Easton (1996) and a broader sociologically based review of the entrepreneurship literature in the article by Thornton (1999). There are also a number of review papers on the construct of social capital that focus on the sources of network-based advantages, but they do not contain a comprehensive discussion of network research within the field of entrepreneurship (Burt, 2000; Lin, 1999; Adler and Kwon, 1999).¹

We begin by defining the three constructs that have emerged as key constructs of theoretical and empirical work in this area: the content of entrepreneurial relationships, the governance of these relationships, and the structure or pattern that emerges from the ties that link actors directly or indirectly to one another. Building on our review of key constructs in

¹ Much of the literature on small firm competitiveness reserves the term network for only those relationships in which deep information exchange, trust, exists. The definition used in this paper is more general; networks are defined as consisting of a set of actors and some set of relationships that link them.
the next section, we follow with a discussion of the theoretical and empirical work that seeks to understand (1) how networks affect the entrepreneurial process and lead to positive outcomes for the entrepreneur or their firms and (2) how entrepreneurial processes and outcomes in turn influence network development over time. Since addressing both dynamics is necessary for building a distinctive network theory of entrepreneurs, we address these two areas in our summary and integration of the major themes and findings.

In order to push research within each of the areas in new directions, Section 5 takes a more critical eye to past work. A goal of this section is to spur another round of theory development and empirical research that takes into account the issues that are raised here. We highlight contradictory or null findings that can be resolved with better conceptualizations of key constructs or the use of more appropriate empirical tests. A review provides us with the ability to integrate new research findings in ways that suggest promising avenues for extending current theoretical models.

Although our recommendations for future research delve into each distinctive research area, we also make a broader case for increased cross-fertilization across process- and outcome-oriented research by exploring how concepts and contingencies currently being explored in one research stream can usefully extend theoretical models in the other stream. We believe this will reduce overly static theorizing, and enhance the richness of the resulting models. To support greater integration, we recommend a greater focus on longitudinal and qualitative research, and the use of multimethod research designs.

3. Elements of networks: content, governance, and social structure

In 1986, Aldrich and Zimmer argued that the entrepreneur is embedded in a social network that plays a critical role in the entrepreneurial process. In the broadest terms, social networks are defined by a set of actors (individuals or organizations) and a set of linkages between the actors (Brass, 1992). In the entrepreneurship network literature, we find that three elements of networks emerge as critical to theoretical and empirical research: (1) the nature of the content that is exchanged between actors; (2) governance mechanisms in relationships; and (3) the network structure created by the crosscutting relationships between actors. These three components emerge as key elements in models that seek to explain the process of network development during entrepreneurial activity and the impact of networks on entrepreneurial outcomes. We realize that multiple theories or ‘approaches’

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2 The characterization of the key features of networks by the content, structure, and governance constructs appears in Amit and Zott (2001) lending further validity to this typology.

3 Another inductively derived typology of relationship characteristics developed by Hite (2000) overlaps to some extent with these constructs. Based on her extensive qualitative research, Hite’s work makes clear that features of networks are not independent of one another. Instead, relationship characteristics appear to cluster together in meaningful ways. So while we analyze and discuss content, governance, and structure separately, the relationship between these constructs, particularly in their development, is acknowledged.
exist that vary in their elaboration and justification of the mechanisms behind the impact of these constructs in the entrepreneurial context. We have summarized them here but argue later that further elaboration and refinement of network theory should be a major focus of future work.

3.1. 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. With the exception of work on the role of networks to access capital (Light, 1984; Zimmer and Aldrich, 1987; Bates, 1997), most research has focused on the entrepreneur’s access to intangible resources. Network relations, for example, provide emotional support for entrepreneurial risk-taking (Bruderl and Preisendorfer, 1998) and this in turn is thought to enhance persistence to remain in business (Gimeno et al., 1997).

A key benefit of networks for the entrepreneurial process is the access they provide to information and advice. Ties to venture capitalists and professional service organizations, for example, are a means for tapping into key talent and market information (Freeman, 1999). A number of studies document that entrepreneurs consistently use networks to get ideas and gather information to recognize entrepreneurial opportunities (Birley, 1985; Smeltzer et al., 1991; Singh et al., 1999; Hoang and Young, 2000).

The reliance on networks is not constrained to the start-up stage. Entrepreneurs continue to rely on networks for business information, advice, and problem solving, with some contacts providing multiple resources (Johannisson et al., 1994). The layering of different types of exchange within the same relationship is termed multiplexity in network parlance. Ties to distributors, suppliers, competitors, or customer organizations can be important as conduits of information and know-how (Brown and Butler, 1995). Case studies of two horizontal manufacturing networks by Human and Provan (1996) revealed that relationships among firms in the network were more multiplex (involving friendship, information, and business exchange) than between comparable firms who did not actively participate in a network.

While the above discussion focuses on the exchange of information, advice, and emotional support, relationships can also have reputational or signaling content (Deeds et al., 1997; Stuart et al., 1999; Higgins and Gulati, 2000; Shane and Cable, 2001). 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. Positive perceptions based on a firm’s network linkages may in turn lead to subsequent beneficial resource exchanges. In support of this, Stuart et al. (1999) found that private biotechnology firms with prominent strategic alliance partners were able to go public faster and at higher market valuation. When such relationships occur widely at the sector-level, it can signal the munificence of the entrepreneurial environment to other potential entrepreneurs thereby spurring start-up activity (Calabrese et al., 2000).
3.2. Network governance

The second construct that researchers have explored is 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; Thorelli, 1986; Krackhardt, 1990) and the threat of ostracism and loss of reputation (Portes and Sensenbrenner, 1993; Jones et al., 1997) 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 (Thorelli, 1986; Jarillo, 1988; Starr and Macmillan 1990; Lipparini and Lorenzoni, 1993; Jones et al., 1997). 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 (Powell, 1990; Uzzi, 1997; Das and Teng, 1998). These expectations reduce transaction costs—for example, monitoring and renegotiating the exchange in reaction to environmental changes—particularly 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 (Saxenian, 1991; Lorenzoni and Lipparini, 1999; Hite, 2000). 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) found that information exchange between clothing manufacturers and their “embedded” small suppliers tended to be more holistic in nature. Suppliers in turn enhanced their product by incorporating elements in the design and manufacturing process that were difficult to articulate, and hence, difficult to communicate solely through the price mechanism. Because of its positive impact on information flows, trusting behavior is cited as a critical factor in enhancing innovation through interfirm collaboration (Hausler et al., 1994) and an integral reason for interfirm networks’ longevity (Lipparini and Lorenzoni, 1993; Saxenian, 1991).

3.3. 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 important impact on resource flows, and hence, on entrepreneurial outcomes. Indeed, who the actors are is secondary to their position in the network structure. As the following discussion of structure-based constructs shows, there is little theoretical distinction between networks of individuals and networks of firms.
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, 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, 1995) and the organization (Katila, 1997; Katila and Mang, 1999; Freeman, 1999; Baum et al., 2000).

Another measure of network position 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. Degree centrality taps the ability of actors to “reach” other actors in their network through 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. Researchers have characterized varying degrees of access to resources by measuring network centrality at the interpersonal (Brajkovich, 1994) and interorganizational levels (Powell et al., 1996; Johannisson et al., 1994).

While network size and centrality measure the amount of resources 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 cluster of contacts. For example, Hansen and Witkowski (1995) found that entrepreneurs who had network ties that extended outside of the United States at the time of start-up were more likely to continue to conduct business abroad. Weak ties are derived from direct and indirect linkages, and it is typical to operationalize them in terms of frequency and primariness (kin, friend, and acquaintance) of contact.

Complementary to the benefits of weak ties are the theorized benefits of bridging structural holes, defined as the absence of ties between 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 unconnected 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. This in turn may spur learning and the development of internal capabilities that ultimately enhance performance (McEvily and Zaheer, 1999; Baum et al., 2000).

Unfortunately, largely because of the challenges of gathering data on crosscutting relationships in order to accurately analyze the bridging concept, research on the development and benefits of bridging structural holes has lagged behind work examining the impact of network size and centrality measures of networking. Despite the difficulties, a number of studies on entrepreneurial firms have been able to operationalize this construct by assessing

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4 A thorough discussion of network measures and the intellectual roots of network theory is found in the works of Wasserman and Faust (1994) and Knoke and Kulinsky (1982).
network density (McEvily and Zaheer, 1999; Burt and Raider, 2000) and heterogeneity among network contacts as proxies (Hara and Kanai, 1994; Zhao and Aram, 1995; Baum et al., 2000; Silverman and Baum, 2000). Density is measured by the extent to which an actor’s contacts are interconnected. The more dense one’s direct network of contacts, the less likely that new resources will enter and the more likely resources will simply recirculate within the group. Heterogeneity-based measures diverge from the structure-based definition in that meaningful categories of actors are created by the researcher to group actors likely to have dense ties within the groups; bridging ties are then assumed to be ties that link the groups. Because identifying and exploiting opportunities are explicitly linked to occupying the bridging position in a network, this structurally based theory has intriguing possibilities for entrepreneurial research (Burt, 2000).

4. Key findings in network-based entrepreneurship research

A characteristic (and to some critics, a weakness) of research on networks is the lack of a core theory that in turn yields a set of well-defined propositions from which network constructs are defined. Instead, network research has been influenced by anthropology, sociology, micro-oriented theories of exchange such as balance theory developed in psychology, and even mathematics. The result is a “loose federation of approaches” (Burt, 1980) in which researchers often debate how concepts are operationalized rather than the underlying theoretical arguments themselves. Therefore, our focus here on network constructs rather than the theories underpinning network-based research is intentional.

Given the intellectual roots from which the network tradition has grown, entrepreneurship scholars have not felt compelled to articulate a distinct network theory of entrepreneurship. While research in this area is diverse, it generally falls into two categories based on the fundamental question behind it. Building on our exploration of the key constructs above, we examine here the theoretical and empirical work that seeks to understand (1) how networks affect the entrepreneurial process and how they lead to positive outcomes for the entrepreneur or their firms (networks as independent variables) and (2) how entrepreneurial processes and outcomes in turn influence network development over time (networks as dependent variables).

Content, governance, and structure emerge as building blocks for models of these dynamics. For example, theories on the impact of networks, albeit often implicitly invoked, fall into two categories that emphasize either governance or structure as key constructs. In the following section, we expand on the above introduction to the empirical research that has emerged from a network-based approach. We focus first on the body of literature that seeks to explain how networks affect the entrepreneurial process and entrepreneurial outcomes. We then turn to theoretical and empirical work that focuses on how the entrepreneurial process affects network development. The review of the empirical work sets the stage for the Section 5, which includes our critiques, attempts at integration, and discussion of the gaps in our knowledge where further research is needed.
4.1. Networks as a critical independent variable

A number of studies confirm the important and varied role that networks play in influencing the entrepreneurial processes and outcomes. Entrepreneurial processes consist of distinctive activities such as opportunity identification, resource mobilization, and the creation of an organization (Shane and Venkataraman, 2000). In contrast, entrepreneurial outcomes can be thought of as critical milestones or the consequences of the entrepreneurial process. Important outcomes are the founding of a new venture and its performance, as well as exit events such as going public, mergers, acquisitions, the formation of alliances, and firm dissolution.

In the earliest stage of the entrepreneurial process, entrepreneurs appear to benefit from diverse information flows. Singh et al. (1999), for example, found that entrepreneurs in the information technology industry with weak ties—operationalized as contacts who were not known well—reported a higher number of opportunities identified within a 12-month period than those with fewer weak ties. In the early start-up stage, the presence of strong ties appears to influence the persistence of nascent entrepreneurs to continue in their formation activities (Honig and Davidsson, 2000).

Research also suggests that there are growth benefits to interorganizational linkages for entrepreneurial firms. Stearns (1996) focused on strategic alliances among a sample of high-technology firms and found that among new firms (under 7 years of age), the presence of a foreign strategic partner was associated with higher rates of growth. Among young firms (between the ages of 7 and 12 years), less diversity in the types of arrangements was associated with lower growth. Zhao and Aram (1995) also found, in a sample of Chinese entrepreneurs, that the intense use of networks distinguished high-growth from low-growth firms. However, our review did turn up a number of studies that found null (Butler et al., 1990) or equivocal results (Merenda et al., 1994), including a study by Aldrich and Reese (1993), which found that networks involved in business start-up had no effect on subsequent business performance.

Our review found more consistent support for Burt’s structural hole argument, a particular variant of the structure-based arguments that attributes advantage to occupying a bridging position within the network. Because of the likelihood that a firm occupying a bridging position will receive new, strategically important information sooner than others in the network, strategy researchers have examined the competitive consequences of occupying structural holes. In research on small to medium-sized firms, McEvily and Zaheer (1999) found that lower-density networks were associated with a greater acquisition and deployment of capabilities necessary for competitiveness in the metalworking segment of the automotive industry. The benefits of structural holes were also supported in research by Baum et al. (2000), which showed that alliance partner heterogeneity had a positive effect on firms’ subsequent financial performance (as measured by revenues) and their innovative capability (as captured by patenting). Recall that the difficulty of gathering complete network data often results in the use of network density and network heterogeneity as proxies for occupying the bridging position.

Other careful research suggests that the advantages of diversity in information and knowledge flows should not be overstated. Uzzi (1996) argues that a balanced network,
consisting of both weak and strong ties, may ultimately be more valuable. Uzzi studied the extended networks (i.e., the suppliers to their suppliers) of clothing manufacturing firms and found a curvilinear relationship between the extent of embedded ties within the broader network and firm survival: very weak or very strong extended networks had a negative effect on survival rates.

4.1.1. Strong versus weak ties

Cumulating evidence that underscores the importance of weak ties has fueled the debate on the relative value of strong versus weak ties. An impressive large-scale survey conducted by Bruderl and Preisendorfer (1998) found that strong ties were more critical than weak ties in explaining firm success as measured by firm survival. These results emerged from a study of over 1600 German founders that controlled for environmental, firm, and individual characteristics such as owner’s education level and work experience. The network measures consisted of questions regarding the extent of social support from direct contacts.

They found that strong ties, as proxied by self-reports of receiving support from friends and family, had a positive impact on business survival and a much smaller impact on sales growth. Weak ties, measured as support from business partners and acquaintances, were found to be a poor predictor of performance. It is important to note that assumptions were made about the weakness of the tie based solely on the role of the contact while network density was not measured. Although the definition of weak ties is problematic, the results for strong ties are more defensible and seem to suggest that entrepreneurs benefit from the ready access to resources.

Resolution of the debate regarding the benefit of strong versus weak ties may ultimately require a contingency approach (cf. Rowley et al., 2000). For example, a focus on strong ties may be more relevant during the founding stage and early growth stage of a new venture when such ties are likely to be most valuable as ready, low-cost links to critical resources (Starr and Macmillan, 1990). There is however mixed support for this assertion. Aldrich et al. (1987) found that young firms (less than 3 years of age), but not older firms, benefited from strong ties in terms of greater profitability. The selection of entrepreneurs in the study was based on a convenience sample, thereby leading to concerns of generalizability. In contrast, Zhao and Aram (1995) found a positive impact of access to resources through networks on firm growth, but they did not find any differences in the resource diversity of the networks of ventures in the feasibility stage versus those at later stages of growth. Both studies took a cross-sectional approach making the results open to other possible interpretations.

In addition to venture stage, network effects may differ according to the outcome of focus. The study by Bruderl and Priesendorf (1998) examined the impact of strong ties on both survival and financial performance. The results were stronger for survival suggesting that the effects of strong ties may not be comparable across measures of entrepreneurial success. In addition, survival can be based in part on one’s persistence in a course of action. Gimeno et al. (1997) found that ventures founded by entrepreneurs from families with a history of entrepreneurship are less likely to fail. These entrepreneurs seem to benefit from the proximity
to entrepreneurial role models and emotional support. Indeed, this group was willing to accept lower thresholds of performance that in turn raised their survival rates. Small businesses, in which the founder has a strong influence on the decision to exit a business, may be a context where strong ties have an impact on firm survival. Another outcome requiring persistence in a course of action is at the pre-start-up phase consisting of activities leading to the creation of a new business venture (Honig and Davidsson, 2000).

Because the results of this work have direct implications for entrepreneurs, we attempted to shed some light on the factors that may affect when strong versus weak ties are likely to yield benefits. If, as Uzzi’s (1996, 1997) work seems to suggest, firms benefit from the mix of these ties, then we need to further examine the trade-offs that entrepreneurial firms face with different network configurations.

4.2. Networks as the dependent variable

In contrast to the research discussed above where they are a key independent variable of interest, networks have also figured as the dependent variable in theoretical and empirical work. Process-oriented network research focuses on the development and evolution of networks over the venture formation process. To this end, one model has been developed that explores the role of networks in the venture creation process. Building on the qualitative research of Starr (1990) and Starr and Macmillan (1990), Larson and Starr (1993) posit that the networks activated for new venture formation follow a three-stage sequence of development. Each stage in the network development process is characterized by distinctive changes in the content of the relationship and the governance mechanisms used to manage the relationship.

In the first stage, the key activity centers on identifying the contacts that will provide critical resources to begin the venture, particularly the use of ties to family, friends, and existing business contacts. During this stage, new contacts are identified and preexisting contacts are tapped for the venture. Entrepreneurs spend significant amounts of time developing new contacts and maintaining existing contacts, averaging over 5 hours a week according to Aldrich and Reese (1993).

In the second stage, they argue that exchange relationships become more multiplex, with relationships that began for instrumental reasons becoming imbued with a social or affective component and ties that were strictly noninstrumental becoming leveraged for economic purposes. In addition, the governance relationship shifts from quid pro quo behavior as a basis for the exchange, to trust and concerns about maintaining one’s reputation.

In the third stage, the network content of the relationships gains further complexity and is characterized by more and higher quality information exchange between partners. Driven in part by the resource requirements of the venture, a critical mass of relationships is established and more significantly, the continued interaction between actors becomes routinized. Ties can

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5 Strong network ties are measured in a limited way, by whether parents of the entrepreneurs are self-employed. This tie is viewed as a type of social capital because self-employed parents may provide structural advantages (e.g., existing ties to business resources) that lower the cost of entry into entrepreneurship.
be characterized as interorganizational relationships when the direct involvement of the individuals that played a role in their formation is no longer needed for the relationships to be sustained.

We review this model here because it provides a promising basis on which to conduct future research on the process of network development in the entrepreneurial context. In particular, the importance of prior network relationships in the venture formation process has received wide confirmation. Birley (1985), Aldrich et al. (1987), Zimmer and Aldrich (1987), and Hara and Kanai (1994) find that preexisting contacts, particularly to friends and family, serve as resource providers during the new venture process. Other confirmatory evidence comes from a longitudinal study by Johannisson (1996) in which the networks of nascent and existing entrepreneurs are examined at the beginning and end of a 6-year period. The network structure shows the dynamics predicted by the Larson and Starr model. That is, there was a tendency toward multiplexity, such that ties that began strictly as business relationships became social relationships by the end of the period. Although the level of analysis differs, the development of multiplex relationships has also been confirmed in process research focusing on the creation and leveraging of networks of established small firms (Human and Provan, 1997).

4.2.1. Cross-sectional research

A hurdle to further elaboration of network development processes is the necessity of observing and gathering network data over multiple points in time. In light of the challenges of gathering such data, a number of researchers carried out cross-sectional studies examining the network structure of different classes of individuals or of firms at different stages of the venture creation process in order to intimate process dynamics (Greeve, 1995; Hansen, 2000). The large sample research is particularly noteworthy but the results raise a number of issues due to the research design.

Network development processes were thought to differ between male and female entrepreneurs with women entrepreneurs requiring network contacts that would provide both legitimacy as well as critical business information (Burt, 1992; Ibarra, 1992). Following this line of reasoning, Aldrich et al. (1986) tested for gender differences in network size and amount of networking activity but found no differences for male and female entrepreneurs. This suggested that the importance of ascriptive groups for organizing networks is overshadowed by similarities across groups in their resource requirements.

In other research, cross-sectional comparisons of managers and entrepreneurs were conducted in order to test whether the activities undertaken by entrepreneurs would result in distinctive kinds of networks when compared to managers. Entrepreneurs must gather a greater variety of resources in constantly shifting orders of importance in order to be successful, while a manager is likely to be engaged in activities that ensure the successful completion of a proscribed set of activities. Differences in the reliance on strong versus bridging ties would support the notion that these two groups differed in the kinds of activities that were critical to their success. In an analysis of the General Social Survey, an annual survey to a representative sample of the US population, Carroll and Teo (1994) found that self-employed people did not differ on key network characteristics from salaried managers.
However, differences were observed between entrepreneurs and nonsalaried employees. Burt and Raider (2000) also found that, among female business school alumni, entrepreneurs had more bridging contacts than employed individuals but no distinction was made between managers and nonmanagers.

5. Recommendations for future network-based research

From the initial insight that networks were a principal medium for the transfer of resources critical to entrepreneurial activity, the empirical and theoretical development of the field has been considerable. However, current work seeking to explain entrepreneurial success is limited by considerable conceptual vagueness regarding the resources that are both rare and valuable to success, and how we measure the networks that provide those resources. Mapping networks of general information flows may be too far removed from resource flows more closely linked to an outcome such as business performance. Butler et al. (1990), for example, found that information-seeking relationships extending from a population of wineries to other organizations relevant to the industry had no relationship to venture performance. Ties that lead to greater access to customers or closer collaboration with suppliers may have a more direct influence on financial performance and should be measured with greater precision. Research by Foss (1993) shows that network data derived from detailed lists of relevant business resources may have more predictive power. If such information is obtained from individuals in order to proxy for firm-level ties, more attention needs to be paid to how network data are elicited. Currently, a standard question to elicit network data asks the entrepreneur to whom he or she would turn for advice or information. This may not be fine-grained enough to evoke meaningful differences in network structure, and if differences are observed, there is little insight into the nuances of the entrepreneurial process that would explain them (Table 1).

A research strategy that focuses on fine-grained resource flows is likely to be more valid within single-industry studies and when networks are based on strategically critical linkages. A within-industry approach and an examination of strategically critical linkages may explain the extensive empirical evidence linking networks to innovative output and financial performance among entrepreneurial organizations within the biotechnology industry (Powell et al., 1996; Shan et al., 1994; Deeds and Hill, 1996; Smith-Doerr et al., 1999). More fine-grained network data including data on indirect ties should be collected over time on a group of entrepreneurs and a control group, such as managers.

Efforts to understand the role of networks in facilitating the acquisition of a variety of resources should be coupled with an effort to expand the kinds of outcomes to be studied. For example, the adoption of new technologies or specific human resource practices within entrepreneurial organizations may be influenced by early links to advisory or support organizations and by attributes of a founder’s network. Merger and acquisition activity among entrepreneurial firms is an important facet of industry evolution that has also received less attention by entrepreneurship scholars, perhaps
Table 1
Key findings and suggestions for future research

<table>
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<tr>
<th>Construct definition</th>
<th>Content</th>
<th>Governance</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The resources exchanged between actors. Focus on both tangible (capital) and intangible resources (access to information and advice, emotional support, legitimacy signals). Multiplexity denotes the exchange of multiple resources.</td>
<td>The mechanisms underpinning an exchange to coordinate and manage the relationship, particularly trust.</td>
<td>The network structure created by the crosscutting relationships between actors, both interpersonal and interorganizational. Measures include network size, centrality, density, strong/weak/bridging ties.</td>
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</tbody>
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Research on networks as independent variables


Recommendations for future outcome-oriented work

| Increase precision of tie content measures. Use longitudinal research design including how networks shape the opportunity that is being pursued. | Expand the kinds of outcomes studied and linked to governance characteristics. | Collect data on indirect ties. Exploration of contingency approach to benefits of weak and strong ties. Explicitly test trade-offs of different network structures. |

Research on networks as dependent variables

| Venture formation process promotes the development of multiplex ties. Preexisting relationships are tapped in early entrepreneurial stages. | Dense cliques, thought to promote trusting behavior, foster greater tie formation than sparsely connected cliques. | No difference in network characteristics between male and female entrepreneurs. Differences among entrepreneurs, managers, and employees. |

Recommendations for future process-oriented work

| Explore impact of entrepreneur attributes and occurrence of | Test Larson and Starr model with longitudinal study | Explore individual differences in accuracy of |
because they are viewed as failure events. Evidence by Hoang (1997) shows that, in the biotechnology industry, network position explained which new biotechnology firms were subsequently acquired by established pharmaceutical firms. The information and collaborative networks that the small firms were able to create were argued to be critical to innovation within the industry and thus valuable to the incumbent firms seeking to stay abreast of technological developments.

5.1. Increasing our understanding of network development processes

Our critique of network process research focuses on the Larson and Starr (1993) stage model because it remains the most complete piece of theorizing about network processes in the entrepreneurial context. Based on subsequent research developments in the field, we raise a number of issues that should be pursued further. First, the model may understate the extent to which network contacts play a role in shaping the very nature of the opportunity that is being pursued. The role of networks in the venture formation process is understated in the Larson and Starr model since it presumes that the entrepreneur begins the search for appropriate contacts once the decision to start the venture has already been made. Although the studies are cross-sectional, and recall bias is a potential weakness, entrepreneurs have reported that their network contacts were a key source of information, or provided the initial idea for the very opportunity being pursued (Young, 1997; Hoang and Young, 2000).

Our understanding of network development process could also be extended with more focused research on the differences across individuals in the extent to which network resources are leveraged. Conventional thinking suggests that network resources are tapped when entrepreneurs are deficient in the resources they control. Cooper et al. (1991), however, found that age and management experience were positively correlated with the use of personal ties for information helpful to the start of a business venture. In addition, the education level of the entrepreneur had a positive effect on the use of professional advisors.6 Thus, the

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6 Interestingly, they found that the use of professional sources was positively related to survival; however, firm and industry characteristics were not controlled for.
process of network development during the early new venture formation stage may be related in surprising ways to the characteristics of the entrepreneur, including his/her financial resources, level of education, and work experience.

Other aspects of the entrepreneurial process, such as the use of a business plan, appear to be a catalyzing activity that prompts entrepreneurs to develop more network contacts. Smeltzer et al. (1991) conducted a telephone survey of business owners in which respondents who developed a business plan had more advisors than those who did not create a plan. Those that developed a business plan also reported that the information gathered during the early formation stage was higher in quality. The closeness of the network contacts (i.e., friend vs. acquaintance) increased the quantity of information received but had no relation to perceptions of the quality of that information. Without the business plan as a focusing device, the resource search process appears to be characterized by some trial and error.

Moreover, while the Larson and Starr model emphasizes the eventual creation of stable interorganizational relationships, network processes are also occurring within the newly formed venture (Krackhardt, 1995; Brajkovich, 1994; Bouwen and Steyaert, 1990). A focus on intraorganizational relations within a small firm context by Krackhardt (1990) shows that there are individual differences in the ability to accurately map who is connected to whom and one’s own position in the network. He argued that extracting benefits from the network might be determined by the accuracy of one’s perceptions of the network structure. Hence, exploring the moderating role of individuals’ network cognition in the organizing process would be another fruitful avenue for extending the model of network development.

While a single network theory of entrepreneurship will not result, we believe that further exploration of these relationships will spur another round of theorizing on the development of networks in the entrepreneurial process. We would discourage, however, the use of cross-sectional research designs to intimate network processes. Although past work in this area was methodologically rigorous, the cross-sectional nature of these studies precludes a clear statement regarding the network development processes of entrepreneurs. One cannot tease apart the unique demands of entrepreneurship that led to changes in network structure or the individuals who became entrepreneurs because of their networks. A cross-sectional comparison of different ventures at varying stages of development is vulnerable to a similar critique. Because the same actors are not observed through time, it is possible that selective attrition, which is unobserved and uncontrolled for, may be driving the results. As a consequence, findings by Hansen (2000), for example, that show differences in network structure across stages of venture formation, may be due to attrition rather than developmental processes. Network process research will require longitudinal study designs in order to make stronger claims for the existence of developmental patterns.

More appropriate research methods should be undertaken to test and extend the network development theory developed by Larson and Starr (1993). In particular, longitudinal network research in the vein of Johannisson (1996) that includes an explicit comparison of entrepreneurs and nonentrepreneurs would fill a gap in this area. Elements of this approach can already be seen in research on nascent entrepreneurship and the results indicate that aspects of an individual’s network do facilitate entrepreneurial activity. In a study of nascent entrepreneurial activity in Sweden in which great pains were taken to survey a
representative sample of the population, Honig and Davidsson (2000) examined whether strong ties to parents, friends, and family were predictive of nascent entrepreneurial activity. Their data show that ties likely to pre-date these activities are critical, successfully differentiating the group engaged in nascent activities from a control group. They also found that ties to business support and service organizations were predictive of nascent entrepreneurial activity. Their work is noteworthy for the use of a control group and attention to the role of networks in entrepreneurial activity.

5.2. Integrating research on network effects and network dynamics

When considering the pace of contributions to the topic of network effects versus that of network dynamics, it is clear that less attention has been paid to the topic of network dynamics. Moreover, given the accretive nature of normative science, it is possible that research on network effects could advance with little cross-fertilization from research on network dynamics. Coupled with the demands imposed by systematic data coding and analysis of network data that tends to oversimplify network processes, there is a great risk of static and overly simplistic theorizing. Research on network outcomes in particular can be far richer and more theoretically nuanced when combined with theoretical insights arising from research on network dynamics.

We anticipate that integrating issues and methodologies found in process- and outcome-oriented research, respectively, will lead to a number of theoretical advances. For research that seeks to explain entrepreneurial outcomes, incorporating processual insights such as order or timing effects could better explain the impact of network resources on venture performance. The notion of timing could be a key contingency that magnifies or attenuates the benefits of accessing certain types of resources. Currently, the importance of timing in accessing resources has been explored effectively in recent research on nascent entrepreneurial activity. Delmar and Shane (2001), building on the Swedish dataset discussed earlier, hypothesized that in the pre-start-up period, engaging sooner in activities that yielded greater legitimacy would have a positive impact on early venture survival. This was confirmed in a sample of nascent entrepreneurs who were interviewed at several time points on whether and when they had engaged in a variety of legitimating, planning, and resource acquisition activities. The order in which activities were carried out was an important predictor of whether ventures persisted or were eventually dissolved. Such work illustrates that an explicit longitudinal approach can allow researchers to go beyond the question of whether networks matter to questions of when and how networks exert their effects on new venture performance and survival.

Exploiting rather than minimizing the richness of the network phenomenon would also shed light on how network effects are shaped by the broader environmental conditions surrounding a venture. The work of Eisenhardt and Schoonhoven (1996) suggests that the market context in which a new venture is immersed explains differences in the networking

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7 These results should be reconciled with the work of Dodd (1997) who found that entrepreneurs did not report belonging to social groups at a higher rate than nonentrepreneurs.
behavior of entrepreneurial firms over time. Key features that differentiated various market conditions were the extent of competition and size and growth rate of the market. Eisenhardt and Schoonhoven confirmed empirically that due to the greater resource needs in the early stages of a venture’s development, combined with the need for flexibility that alliances provide, alliance behavior was greater during the early stages of a market’s development compared to later mature, market stages.

The conception of a firm’s environment has also been framed in network terms and examined for its impact on subsequent network formation and development processes. Walker et al. (1997) found that clusters of firms dense with shared common partners were stronger sources of new alliances than more sparsely interconnected groups.8 Jones et al. (1997) argue more broadly that the degree of structural embeddedness or interconnectedness within a network supports the use of certain governance mechanisms that facilitate exchange. In particular, dense networks can reinforce trust-building efforts between partners. Further work could be done on the impact of different network environments on the speed and timing of network development processes in entrepreneurial ventures. To support this effort, the use of p* models developed by Wasserman and Patterson (1996) and the related approach taken by Gulati and Garguilo (1999) offer a means of uncovering structure across multiple networks and testing the robustness of these structural relationships statistically.

Finally, while researchers have been preoccupied with the reverse relationship, entrepreneurial successes and failures are an important contingency that may shape future network activity and structure. Inability to garner the resources necessary for start-up, or the outright failure of a venture, is likely to shape network activity in future ventures. An entrepreneur who believed that a weakness in marketing was the key to the failure of a past venture may be more likely to develop contacts or form a management team that overcomes that skill gap. In contrast, success may validate an approach to managing interpersonal relations between suppliers, customers, and competitors that becomes elaborated and formalized over time.

6. Conclusion

The interest in networks will continue to draw scholars and newcomers into the debate, and this review was intended to ease their transition by defining core concepts and theories and outlining key studies and empirical results over the field’s 15-year span. We discussed current issues as well as promising areas for integration and extension in the outcome-oriented and process-oriented research streams within the field. In the process of reviewing the literature, we noted that the focus on network development processes over the venture gestation, formation,
and growth life cycle is receiving less attention than it should. We have pointed out the potential implications of ignoring network dynamics in the theoretical development of this field. We would like to end by making a plea for more qualitative, inductive research that will stimulate further work by introducing new theoretical ideas. Such research is often too quickly dismissed because of concerns regarding generalizability and the criticism that it tends to be descriptive rather than predictive (Borch and Arthur, 1995). Given the state of knowledge surrounding the early organizing process and the development of networks, we believe that the potential contributions of such studies far outweigh their limits.

Researchers could go even further by undertaking multimethod studies that combine the strengths of different methods in a series of projects that build on one another (Brewer and Hunter, 1989). This combination has a number of advantages. Field research in which the researcher enters the social setting for firsthand observation can yield insights into the specific resources that fuel business success in a particular context. Fieldwork can also better address how personal networks of founders and founding teams become embedded in the systems and competencies of the firm and result in organizational-level advantages. When guided by the insights generated from qualitative research, a study based on survey or nonreactive data is more likely to capture network dynamics and be more predictive of subsequent entrepreneurial outcomes. Quantitative research in turn allows researchers to assess and statistically control for other competing theories. On the whole, multimethod studies should be encouraged because they can yield richer insights and support strong causal claims regarding the role of networks in entrepreneurship.

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