

# Chapter Twelve

## Organizational Networks

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If the maxim “networks matter” was discounted during a period dominated by economic theories of firms, considerable theoretical research and empirical evidence has since infiltrated the scholarly consciousness. If scholars previously modeled and encapsulated the environment within measures of competitiveness in product or supplier markets, we know now that the organization’s environment is much broader encompassing its social network of external contacts. We also know that these external contacts have implications for the organization’s survival and livelihood. For example, we know that firms organized in networks have higher survival chances and that prestigious partners help firms go to IPO faster and gain higher valuations at IPOs than firms which do not have these partnerships.

Network perspectives build on the general notion that economic action does not take place in a barren social context but is instead embedded in a social network of relationships. A social network can be defined as a “set of nodes (e.g., persons, organizations) linked by a set of social relationships (e.g., friendship, transfer of funds, overlapping membership) of a specified type” (Laumann et al., 1978, p. 458). While the original focus of network research was on understanding how the embeddedness of individuals influences their behavior, a similar argument has been extended to organizations (Burt, 1982; Walker, 1988; Mizruchi, 1992; Gulati, 1998). Organizations can be interconnected with other organizations through a wide array of social and economic relationships, each of which can constitute a social network. These include supplier relationships, resource flows, trade association memberships, interlocking directorates, relationships among individual employees, and prior strategic alliances.

We focus on organizational networks: the focal organization’s pattern of relationships with other organizations in the same network. Specifically, the organization’s egocentric network consists of the focal organization (called ego), a set of organizations (called alters) who have ties with ego, the ties between ego and alters, and the ties between alters (Wasserman and Faust, 1994). The egocentric organizational network is a channel through which the focal organization obtains resources and information from the environment that is quality-controlled in both its content and credibility.

Scholarship on egocentric organizational networks has focused primarily either on their effects on firm behavior such as new alliance formation and partner selection (Gulati, 1995a; 1995b; 1998), or on the effects of specific types of ties, such as cohesive ties or bridging ties, on information benefits (e.g., Stuart, 2000; Anand and Khanna, 1995). Recently, scholars have extended these ideas and begun to examine

- 1 how social networks are created, and
- 2 how adopting a network lens can lead to a deeper understanding of differences in firm performance (Gulati, Nohria, and Zaheer, 2000).

In this chapter, we move from reviewing the impact of social networks on *behavior* to studying their formation and their implication for *firm performance*. Table 12.1 summarizes the key research themes we address and identifies key studies we consider within each theme.

## Literature Review, Summary, and Evaluation

### FORMING ORGANIZATIONAL NETWORKS

Until recently, scholars had viewed the creation of egocentric organizational networks as driven largely by exogenous factors such as the distribution of resources and the social structure of resource dependence (e.g., Aiken and Hage, 1968; Pfeffer and Salancik, 1978; Burt, 1983). The resource dependence perspective suggests that firms will create ties with those whom they share the greatest interdependence (Pfeffer and Nowak, 1976). Although the resource dependence perspective sheds light on the critical contingencies guiding the creation of new ties, one drawback of this perspective is that it assumes an atomistic environment in which information about other organizations is widely available and freely accessible to all.

Network scholars have extended the resource dependence perspective and focused on the role of the social context, primarily, the cumulation of prior ties between firms for the formation of new organizational networks (Gulati, 1995b; Gulati and Gargiulo, 1999). They suggest that prior inter-firm ties create a social network in which most firms are embedded and that this network shapes the flow of valuable information about new tie opportunities and the reliability, capabilities, and trustworthiness of these potential partners. The informational advantages to firms from such a social network can enable the creation of new ties by three distinct means: access, timing, and referrals (Burt, 1992). Access refers to information about current or potential partners as to their capabilities and trustworthiness. Timing entails having informational benefits about potential partners at the right time. Referrals can be particularly important in tie formation, as a firm's existing partners may refer other firms to it for partnering or to enter three-way partnerships.

Recently, Gulati and Gargiulo (1999) have suggested that network formation results from a dynamic process driven both by these exogenous interdependencies that prompt organizations to seek cooperation and by endogenous network embeddedness mechanisms that help them determine with whom to build partnerships. The network emerges as a result of an iterative process in which new partnerships modify the previous social

**Table 12.1** Selected studies of organizational networks

<i>Reference</i>	<i>Key concepts</i>	<i>Key variables</i>	<i>Key predictions and findings</i>	<i>Key contribution</i>	<i>Sample and method</i>
Baum et al. (2000)	<ul style="list-style-type: none"> <li>Network configuration (vertical and horizontal ties; strong and weak ties)</li> </ul>	<ul style="list-style-type: none"> <li>Network size at founding</li> <li>Network efficiency at founding</li> <li>Innovative capabilities of potential rivals</li> </ul>	<p>Organizational alliance network should be configured to provide efficient access to diverse information and capabilities with minimum redundancy, conflict and complexity. In addition, the firm should ally with rivals who provide more opportunity for learning but less risk of intra-alliance rivalry.</p>	<p>Reveals how the network configuration of start-ups affects their performance</p>	<ul style="list-style-type: none"> <li>142 Canadian biotech start-up firms that began operations (1991–6)</li> <li>Random effect GLS model</li> </ul>
Dyer and Nobeoka (2000)	<ul style="list-style-type: none"> <li>Knowledge sharing</li> <li>Network identity</li> <li>Dynamic learning capability</li> </ul>		<p>A highly interconnected network benefits all network members by facilitating knowledge sharing and learning and increasing productivity of the members.</p>	<p>Evaluates why some firms' networks provide their member more benefits than the networks of other firms</p>	<ul style="list-style-type: none"> <li>Toyota's vertical network</li> <li>Exploratory multi-method case study; interview, archival, and survey</li> </ul>
Gulati (1999)	<ul style="list-style-type: none"> <li>Network resources</li> <li>Firm capability</li> </ul>	<ul style="list-style-type: none"> <li>Cliques</li> <li>Closeness</li> <li>Experience</li> </ul>	<p>Both time-varying network resources and a firm's alliance formation capability increases the likelihood of a firm entering further alliances.</p>	<p>Illustrates how network resources and firm capability affect a firm's decision to enter new alliances</p>	<ul style="list-style-type: none"> <li>166 largest firms in three worldwide sectors: new materials, industrial automation, and automotive products (1981–9)</li> <li>Panel probit model</li> </ul>

<i>Reference</i>	<i>Key concepts</i>	<i>Key variables</i>	<i>Key predictions and findings</i>	<i>Key contribution</i>	<i>Sample and method</i>
Gulati and Gargiulo (1999)	<ul style="list-style-type: none"> <li>• Interdependence</li> <li>• Prior alliances</li> <li>• Common third parties</li> <li>• Joint centrality</li> </ul>	<ul style="list-style-type: none"> <li>• Interdependence</li> <li>• Structural differentiation</li> <li>• Repeated ties</li> <li>• Common ties</li> <li>• Joint centrality</li> </ul>	<p>The probability of a new alliance between specific organizations increases with their interdependence and also with their prior mutual alliances, common third parties and joint centrality in the alliance network. Also, the differentiation of the emerging network structure mitigates the effect of interdependence and enhances the effect of joint centrality on new alliance formation.</p>	<p>Demonstrates the significance of the social network in shaping firm behavior of alliance formation</p>	<ul style="list-style-type: none"> <li>• Same sample as Gulati (1999)</li> <li>• Cross-sectional time series panel design (1970–89)</li> <li>• Level of analysis is the dyad</li> <li>• Random-effects panel probit estimates</li> </ul>
Ingram and Baum (1997)	<p>Network benefits and constraints</p>	<ul style="list-style-type: none"> <li>• Local experience</li> <li>• Non-local experience</li> <li>• Local market power</li> <li>• Reputation</li> <li>• Competitive dynamics</li> </ul>	<p>Firms increase their survival chances by participating in a network because the network provides the advantages of knowledge transfer and learning, scale economies, access to resources, market</p>	<p>Assesses the effect of participating in a chain network on firm survival</p>	<ul style="list-style-type: none"> <li>• 58 transient hotels operated in Manhattan (1898–1980)</li> <li>• Piecewise exponential model of hazard rate</li> </ul>

			power, and reputation. But the firm may also suffer from strategic constraints. Whether the firm benefits from the membership depends on which predominate.		
Rowley et al. (2000)	Exploration and exploitation	<ul style="list-style-type: none"> <li>● Strength of the ties</li> <li>● Density of local network</li> <li>● Industry environmental requirement</li> </ul>	Firms in dense local network and/or having environmental requirement of exploration should favor weak ties.	Illustrates how network configuration and an industry's environment interact with each other to affect firm performance	<ul style="list-style-type: none"> <li>● Semiconductor network and steel industry network (1990–7)</li> <li>● Number of ties is 132 in semiconductor industry; 138 in steel industry</li> </ul>
Stuart et al. (1999)	<ul style="list-style-type: none"> <li>● Status transfer</li> <li>● Prominence of partners</li> </ul>	<ul style="list-style-type: none"> <li>● The rate of IPO and the market capitalization at IPO</li> <li>● Prominence of affiliates</li> <li>● Prominence of investing banks</li> <li>● Firm attributes</li> <li>● Environmental conditions</li> </ul>	Young firms with prominent partners go to IPO faster and earn greater valuations at IPO than firms that lack such connections. These benefits are amplified when the uncertainty about the quality of the young firms' product increases.	Shows how partner profiles in a firm's network affects its performance	<ul style="list-style-type: none"> <li>● 301 biotechnology firms specializing in the development of human diagnostics and therapeutics, and funded by venture capital firms (1978–91)</li> <li>● Models: Hazard rates, piecewise exponential, OLS regression</li> </ul>

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network, which then shapes the formation of future cooperative ties. The authors, however, found that the influence of interdependence and network factors on the formation of organizational networks was not constant over time. The effect of these factors is moderated by the level of the social system's structural differentiation: the extent to which organizations occupy an identifiable set of network positions and a proxy for the amount of information available in the emerging network. The higher the structural differentiation of the network, the lower the effect of interdependence, and the greater the effect of endogenous variables will be on the likelihood of tie formation. Underlying these findings is the idea that existing ties enable organizations to decide with whom to build new partnerships. These new ties increase the amount of information available that in turn enhances the potential to shape future partnerships.

## NETWORK RESOURCES AND CONSTRAINTS AND THEIR IMPLICATION FOR FIRM PERFORMANCE

Participating in a network benefits members by providing opportunities for the sharing of various kinds of resources. Several recent studies of network effects on firms have indicated that these resources may include financial (Ingram and Inman, 1996; Keister, 1998), institutional (Baum and Oliver, 1991), knowledge and information resources, as well as a host of other resources in the network (Ingram and Inman, 1996). On the one hand, the structured opportunity for resource sharing may benefit members by improving their financial performance (Berg et al., 1982; Keister, 1998), increasing their survival chances (Baum and Oliver, 1992; Ingram and Inman, 1996; Ingram and Baum, 1997) and enhancing their innovative/learning capability (Gemser et al., 1996; Dyer and Nobeoka, 2000). On the other hand, membership in a network in and of itself may limit members from discovering opportunities and information outside the network and may limit the local adaptability of the firms (Ingram and Baum, 1997). As a consequence, these ties may negatively influence firm performance. Networks giveth; networks taketh away.

### FINANCIAL RESOURCES

In some instances, networks enable firms to gain access to capital necessary to sustain firm operations and invest in firm growth. One specific instance in which this may occur is when networks substitute for formal financial systems and give firms access to otherwise scarce resources and unaffordable business opportunities (Keister, 1998). Rather than, or in complement to, relying on banks for capital, members can take advantage of the opportunity to share financial resources in their own network of firms. Because financial resources are shared within the network, where firms have more information about each other, transaction costs are likely to be lower (Khanna and Rivkin, 2001). Financial resources are especially relevant in emerging markets where formal financial infrastructures are not well established (Khanna and Palepu, 1999). For example, evidence from 40 of the largest Chinese business groups and their 535 members indicates that members reported higher financial performance and productivity when informal financial arrangements were made for them to share financial resources (Keister, 1998).

## INSTITUTIONAL RESOURCES

Institutional resources result from the legitimacy and status of the organizational network as a whole. By association, members are accorded the legitimacy and status of the network to which they belong. For example, a consumer's uncertainty about a new product's quality may be mitigated if the consumer learns that a member of a highly reputable network produces this product. These resources can help increase the survival chance as well as the financial performance of the members (Khanna and Palepu, 1999). For example, Ingram and Baum's (1997) study of chain affiliation of Manhattan hotels during 1898-1980 suggests that a hotel that joins a high-status hotel chain signals its high status. As a consequence, consumers' uncertainty about the quality of the hotel's service is reduced and the survival chances of the hotel are increased.

## KNOWLEDGE AND INFORMATION RESOURCES

Knowledge and information resources of a network refer to the collective knowledge owned by all firms within the network. The network connections can be a conduit for disseminating both existing and newly acquired knowledge so that all members can quickly access it. In a study of diffusion of Total Quality Management (TQM) practices, Westphal et al. (1997) found that hospital networks were an important medium for the transmission and diffusion of TQM practices among hospitals. As a result of such diffusion networks, the learning/innovative capability of the members was enhanced. Ingram and Baum (1997) also found that hotel chain networks facilitate knowledge transfer and learning among members and increase the survival chances of the members. Similar effects have also been reported in supplier networks of automobile companies such as Toyota (Dyer and Nobeoka, 2000). In Toyota's vertical network, common identity and strongly interconnected ties between Toyota and its suppliers as well as among suppliers themselves facilitate knowledge sharing and learning providing its members learning and productivity advantages over non-members.

Although networks provide opportunities for firms to share various resources, they may also constrain members and contribute to their negative performance. First, being a member of a network may lock a firm into the existing relationships (Nohria and Garcia-Pont, 1991; Gomes-Casseres, 1994) and prevent it from joining another network. Second, network membership may expose the firm to the risk of unwittingly transferring valuable knowledge and proprietary information to competitor firms in the network (Doz and Hamel, 1998; McEvily and Zaheer, 1999). Third, being a member of a network may compel a firm to adhere to norms and practices that meet the lowest common need of the firms. These practices and strategies may not be the most suitable ones for every member's circumstance (Ingram and Baum, 1997; Westphal et al., 1997).

## FIRM NETWORK CHARACTERISTICS AND THEIR IMPLICATION FOR FIRM PERFORMANCE

Scholarship on the effects of a firm's network characteristics – the pattern of relationships a focal firm has with other firms – has focused primarily either on their effects on

firm behavior such as new alliance formation and partner selection (Gulati, 1995a; 1995b; 1998), or on the effects of specific type of ties characteristics, such as cohesive ties or bridging ties, on information benefits (Anand and Khanna, 1995; Stuart, 2000). Less attention has been paid to whether and how the structural characteristics of organizational networks account for the performance differences among firms and the performance of those ties themselves (Gulati and Lawrence, 2000; Gulati and Wang, 2000). Further, there have been few efforts to link the structural characteristics of the organizational network of a firm with other organizational characteristics (e.g., size, age, overall strategies) and with other competitive and institutional environments to explain the performance differences among firms.

Three dimensions of an organization's network – centrality within the overall network, structural configuration of ties, and partner profiles – affect the value it derives from that network. As a result, a focal firm's performance depends on its ability to position itself and configure its ties (e.g., weak versus strong, bridging versus cohesive) in a way that optimizes both its access to information and its ability to exert control over others in its organizational network. A firm's performance is further influenced by its ability to construct ties with partners through whom it will gain status and knowledge, and from whom it is able to capture network resource spillovers. We discuss each of the three dimensions of an organization's network and their implications for firm performance.

#### NETWORK CENTRALITY OF A FIRM IN THE OVERALL NETWORK

A firm's network centrality refers to the degree to which the firm has a strategically important position in the network (Freeman, 1979). Being central in a network provides a focal firm various information advantages (in the form of access, timing and referral), control benefits (i.e. power) and learning (Gulati, 1999). The three most widely used centrality indicators – degree, closeness, and betweenness centrality – capture different ways in which a firm is able to extract value from its organizational network. Degree centrality refers to the extent to which a firm is involved in the network and is measured by the number of the firm's direct ties (Freeman, 1979). High degree centrality makes a firm more visible to other firms in the network and increases its chance of being reached by other firms for new rewarding opportunities. As a result, high degree centrality is likely to facilitate the magnitude of value the firm extracts from its network and to lead to positive performance consequences. At the same time, degree centrality also reflects the total experience of the focal firm in cooperating with other firms. Researchers have found that prior experience facilitates value creation through learning. The lessons include not only managerial capabilities associated with interfirm alliances, but also the capability to create new alliances (Dyer and Singh, 1998; Lyles, 1988; Gulati, 1999). Therefore, the higher a firm's degree centrality, the more cooperative experience the focal firm has and the more capabilities it has to extract value from these alliances.

Although degree centrality may provide firms with information and learning benefits, it is at best an incomplete indicator of firm centrality. By only counting the number of ties in which a focal firm is involved, degree centrality assumes the homogeneity of the ties in providing the firm with information and learning benefits. It does not tell us where these ties are positioned in the whole network. In fact, the empirical evidence on



the linkage between degree centrality and firm performance is very limited and mixed. For example, Shan et al. (1994) found that the number of ties between start-up firms and established firms is positively related to innovative output in biotechnology industry. Gulati (1999) found that the number of alliances formed by the focal firm affects its capability to form new alliances in the future. Stuart (2000), however, found that a simple count of the number of alliances does not affect firm performance as measured by rate of innovation and rate of sales growth. While the relationship between degree centrality and firm performance has yet to be disentangled, other centrality indicators are clearly necessary to illustrate how firm centrality is related to the value created by a firm from its organizational network.

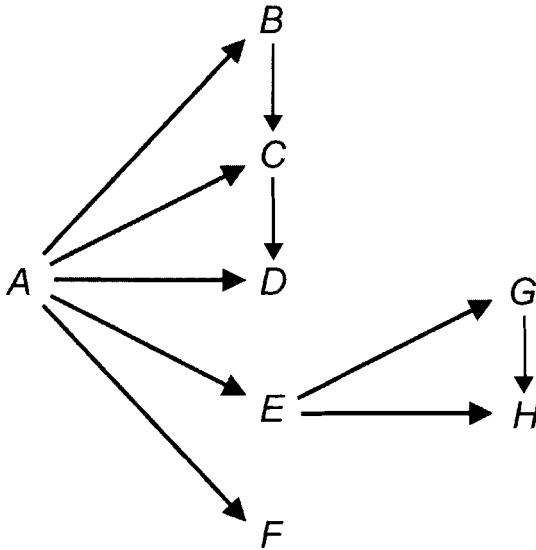
The other two frequently used centrality indicators are closeness centrality and betweenness centrality. Closeness centrality indicates how closely connected a firm is to the rest of the firms in the network, both directly and indirectly. It is computed as the shortest path distance of each actor from others in the network (Freeman, 1979). A central firm can interact with other firms quickly and access information more rapidly (Wasserman and Faust; 1994; Gulati, 1999). This information may include the knowledge of new business opportunities as well as information about valuable innovations. In addition, high closeness centrality reveals that the focal firm is more easily accessed by other firms in the network and thus is more likely to be referred by other firms when rewarding opportunities are available.

Betweenness centrality is the extent to which a firm lies between other firms in the network. It is computed as the frequency with which an actor falls between two other actors on the shortest paths connecting them (Freeman, 1979). The importance of betweenness centrality has been documented in various communication networks and interlocking directories (Mizruchi, 1982; Mintz and Schwartz, 1985). The basic argument is that an actor who lies between two other nonadjacent actors occupies an important strategic position by having greater control of the interactions between them in terms of both information and resource flow (Freeman, 1979). Furthermore, it may also gain favorable terms in negotiations by playing the two unconnected firms against each other (Burt, 1992). Therefore, high betweenness centrality may allow a focal firm to extract more value from its network through its powerful position in the network.

### CONFIGURATION OF TIES IN THE FIRM'S NETWORK

Another dimension of the firm's network is its structural configuration of ties: the composition and positioning of different types of ties. The importance of the ties' structural configuration arises from the varied benefits a firm can extract from the different types of ties (Baker, 1990). There are many ways to categorize inter-firm ties, such as strong versus weak ties, cohesive versus bridging ties, horizontal versus vertical ties, and institutional versus non-institutional ties. We focus on two configurations of ties in the network: cohesive versus bridging ties and strong versus weak ties.

A cohesive tie is one that connects a focal firm with another firm which is also connected with at least one another partner of the focal firm. A bridging tie within a focal firm's egocentric network is a tie that connects the focal firm with another firm that is not connected with any partner of the focal firm. For example, in the network of Firm A (Figure 12.1), AB, AC, and AD are all cohesive ties while AE and AF



**Figure 12.1** Example of an organizational network

are bridging ties. A strong tie in a focal firm's network connects the focal firm and another firm with which the focal firm has intensive interaction. Weak ties, on the other hand, consist of the focal firm and another firm with which the focal firm only has very few interactions.

Strong versus weak ties emphasize dyadic properties and do not consider other ties in the network. Cohesive versus bridging ties, however, concern broader aspects of the egocentric network representing the extent to which a particular tie is embedded in both prior ties between the two parties and in third party ties. For example, a firm's organizational network that is rich in cohesive ties may also contain many connections between this firm and other firms but there will also be many connections among its partners. A firm's network that is rich in strong ties, however, means that the firm has many strong direct ties with other firms, but provides no information about the connection between its partners. Although, empirically, strong ties tend to be cohesive ties and weak ties tend to be bridging ties (Burt, 1992), this is not necessarily always the case. Bridging ties could be either strong or weak depending on the intensity of interaction between the focal firm and another firm with whom the focal firm ties (Burt, 1992; McEvily and Zaheer, 1999).

- Cohesive ties versus bridging ties** In different ways, both cohesive ties and bridging ties benefit firms. Cohesive ties reduce both transaction and coordination costs through social norms and sanctions that facilitate trust and cooperative exchange (Coleman, 1988; Gulati and Singh, 1998). Bridging ties provide information and control benefits (Burt, 1992) for the focal firm in the form of access, timing, and referral to information and learning opportunities. Just as they benefit firms, however, cohesive and bridging ties can also harm them. For example,

cohesive ties may prevent firms from obtaining new non-redundant information. Similarly, a firm with bridging ties assumes the risk of partnering with firms with whom it has limited prior cooperative experiences (Gulati, 1999; Gulati and Wang, 2000).

Given the complexity of benefits and constraints provided by cohesive ties and bridging ties, the question is less about which ties are better because a firm's network usually consists of both types of ties. The more relevant question is: How do firms configure the two types of ties in a way that maximizes the benefits of both safety and opportunity as well as minimizing the risks involved in the cooperative relationship? In a recent study, Baum et al. (2000) found that startups in the biotechnology industry enjoy greater performance advantages when their networks are configured in a way that provide efficient access to diverse information and capabilities, more opportunity for learning, and less risk of inter-alliance rivalry.

- **Strong ties versus weak ties** Another way to think about the structural configuration of ties in a firm's egocentric network is by examining how strong ties and weak ties are configured (Uzzi, 1996; Baker, 1990). Strong ties promote trust and reciprocity and facilitate the transfer of private information and critical resources at the dyadic level. A firm with many strong ties and few weak ties, however, trades with a confined set of partners and may seal itself off from the market. It will, as a consequence, receive less new information about opportunities in the market. It may also develop resource dependence on the partners with whom the firm has strong ties. Weak ties, on the other hand, provide the firm with new information and opportunities in the market (Granovetter, 1985). It may also reduce the resource dependence of the firm on its strong partners (Baker, 1990). Therefore, a firm should configure its network in a way that fits its strategic needs for both information and resources. Baker (1990), for example, found that firms usually develop a combination of strong and weak ties with their investment banks to exploit the benefits of both types of ties yet avoid their disadvantages.

Although both cohesive ties and strong ties create trust between a firm and its associated partners, a cohesive ties argument emphasizes that trust emerges from the firm's embeddedness in a social network beyond the dyad, while a strong ties argument proposes that trust comes from the intensive interaction within the dyad. By the same token, although both bridging ties and weak ties bring new information and opportunities to the focal firm, a bridging ties argument focuses more on the fact that the focal firm and the bridging partner connect two disparate networks (thus two distinctive sets of information sources). Conversely, a weak ties argument focuses more on the fact that new information comes from sources with whom the focal firm does not frequently interact.

Ultimately, the appropriate tie configuration may depend on the context in which firms are situated. A focal firm situated in a dense network may benefit more from an egocentric network rich in bridging ties and weak ties because the social context already provides the benefits that it might otherwise receive from cohesive ties and strong ties (McEvily and Zaheer, 1999; Rowley et al., 2000). Strong ties may be favored in a stable exploitative environment such as the steel industry while weak ties may be favored in

an uncertain or an exploration environment such as the semiconductor industry (Rowley et al., 2000).

The design of the egocentric network may also depend on the information and resource needs of the focal firm. For example, if a firm's strategic objective and overall survival requires access to reliable sources of information, then the firm may want to develop more cohesive ties. In contrast, if the strategic objectives necessitate acquiring novel information and continuous learning, then an egocentric network rich in bridging ties may be more beneficial to the firm. Ultimately we need a more contingent model of the relationship between network configuration and firm success.

## PARTNER PROFILES

Partner profiles refer to the traits of a focal firm's partners. We discuss how three aspects of partner profiles – partner's status, technological distance from focal firms, and its network characteristics – affect the focal firm performance.

Recent research suggests that the status of a focal firm's partners is positively related to the focal firm's performance (Stuart, 2000). The underlying mechanism is status transfer between the partners. As a result, strategic alliances with high-status firms can enhance the status of a focal firm. The public markets are likely to view the gaining of a prestigious alliance partner as an endorsement of a focal firm's quality. This is especially true for small and young firms when the uncertainty about the quality of the firm's product is high (Stuart et al., 1999). For example, Higgins and Gulati (2000) found that the greater the number of top management team ties to prominent biotechnology organizations and pharmaceutical and/or healthcare organizations, the greater the prestige of the firm's investment bank. They also find a positive relationship between these ties and IPO success.

A second partner attribute that may affect firm performance is the technology distance between the focal firm and its alliance partners. Researchers have suggested that this distance positively affects a firm's innovative outputs, its ability to adapt to its technological position, and its ability to overcome organizational inertia (Stuart and Podolny, 1999). Two firms are proximate in technological network if their innovative activities are similar. When a focal firm forms an alliance with another technologically distant firm, novel technological innovations are more likely, resulting from combining complementary but distinctive sets of innovative capabilities from the two firms. In addition, such an alliance also provides potential opportunities for the focal firm to acquire new knowledge from its partners and thus extend its knowledge base into new and unrelated areas away from their core business area. Alliances with technologically distant partners, as a result, represent a potentially effective way to overcome organizational inertia and adapt to new technological areas critical to a focal firm's success.

Finally, focal firms can benefit by capturing spillovers of their partners' network connections. By connecting to a partner with rich network resources, a focal firm increases its prospects of accessing information from its partner's network. In a recent study, Gulati (1999) showed how the amount of network resources available to firms affects their proclivity to enter new alliances. This argument could easily be extended to consider the impact of network resources for firm performance. Furthermore, it would also be possible to consider the extent to which the partners of central firms benefit directly and indirectly from allying with them.

## Contemporary Issues and Debates

### MEASURING FIRM PERFORMANCE

The recent efforts to understand the performance implications of strategic networks raise the practical debate of how best to capture and measure these effects. One approach to estimating the performance of firms would be to measure how much value the public markets attributed to each network member from participating in that particular network. For example, several alliance researchers have conducted event study analyses on the stock market effects of alliance announcements (McConnell and Nantell, 1985; Mohanram and Nanda, 1997; Anand and Khanna, 2000). To the extent that stock market reactions predict the likely future outcomes from alliances, these results provide evidence on the consequences of alliances for firms. Another method of measuring firm performance involves estimating the extent to which firms are embedded in alliances and the likelihood of their survival. Thus, survival is considered a proxy for performance (Baum and Oliver, 1991, 1992; Mitchell and Singh, 1996).

In a related line of research, scholars have looked at the factors that contribute to an alliance's success and not just to firm success (Heide and Miner, 1992; Parkhe, 1993; Gulati and Lawrence, 2000). Although these researchers looked at the performance of individual alliances, their measurement approach merits emulation in examining network effects on firm performance. Rather than relying solely on archival measures, these researchers collected more substantive information with surveys and in-depth interviews with individual alliance members. It would be fruitful to examine the role of the antecedents of alliance success on the success of firms entering those alliances.

Another issue regarding the study of performance concerns the fact that the majority of studies examining the performance implications of a firm's egocentric network characteristics focus on a few industries. Among these are the semiconductor (Anand and Khanna, 1995; Stuart and Podolny, 1999; Rowley et al., 2000; Stuart, 2000), computer (Anand and Khanna, 1995), and biotechnology industries (Shan et al., 1994; Baum et al., 2000). These are all high technology industries, and therefore the results may reflect idiosyncratic findings specific only to firms in such industries and not to wider trends. In addition, most studies only look at one industry at a time yet industry characteristics are important in determining whether certain networks are effective or not (Berg et al., 1982; Gemser et al., 1996). As a result, there is a need for cross-industry analyses that would allow the development of more contingent models of network effects.

### MICRO-LEVEL INFLUENCES ON PERFORMANCE

In this chapter, we have adopted primarily a macro-network perspective; however, there are also micro-network concerns that have implications for organizational behavior and performance. One example is the role of social psychological processes in egocentric organizational network formation. Whereas most research avoids these processes, such an orientation obscures the complexity of human interaction, and thus the social psychological process that directs such behavior (Zajac and Olsen, 1993; Ring and Van de

Ven, 1994; Doz and Hamel, 1998; Kale et al., 2000b). Adopting a perspective that emphasizes the behavioral aspects of organizational life as well could add significantly to our understanding of network formation and firm performance.

An important behavioral concept that has been much studied for interfirm alliances is trust (Barney and Hansen, 1994). Scholars have incorporated this affective dimension of trust to demonstrate its importance in influencing behavior and outcomes in alliances (Dyer and Singh, 1998; Dyer and Nobeoka, 2000). In one study, Zaheer et al. (1998) demonstrate how interorganizational trust reduces both the costs of negotiation between partners and conflict between them as well as directly influencing firm performance. Similarly, Kale et al. (2000b) indicate how the management of conflict between network partners is key to enabling partners to share information and know-how, developing trust, and ultimately, to foster learning.

Another social psychological process with potential implications for firm performance in strategic alliances is that of procedural justice. This process suggests that people evaluate the fairness of dispute resolution and allocation processes in terms of the procedures used to carry them out. The application of procedural justice is evident in studies that stress the relational value of "voice" in partnerships (Helper, 1991). These studies suggest that partners will be more satisfied with their relationship to the extent that each allows the other symbolic opportunities to contribute to the whole design, production, and marketing process even if some of these inputs do not ultimately influence the outcomes which result.

## **Central Questions that Remain Unanswered**

### **ARE THE EFFECTS OF THE ORGANIZATIONAL NETWORK ON FIRM PERFORMANCE INVARIANT?**

We believe that network effects on firms are likely to vary systematically with the context in which they occur. Two such contingent factors include the characteristics of the firm and the industry characteristics of which the firm is a part. In empirical terms this indicates a possible interaction between industry and firm characteristics with measures of a firm's network such as centrality, tie configuration, and partner profiles.

There is suggestive evidence that organizational performance may vary with the interactive effect of firm or industry characteristics and network characteristics. For example, two related firm characteristics that have been extensively studied are organizational age and size. It is quite likely that young and small firms often obtain more benefits from their networks than their larger and older counterparts because of status transfer, enhanced legitimacy, and access to resources (Baum and Oliver, 1991). With respect to industry characteristics, in an exploitation environment, where firms are out to exploit their existing technologies, skill, or information (March, 1991), a firm belonging to a network characterized mainly by strong ties is likely to perform better. In an exploration environment, however, where firms are out to explore for new innovations and opportunities, a firm belonging to a network characterized mainly by weak ties is likely to perform better (Rowley et al., 2000). It is also possible that in highly institutionalized environments, new firms may have greater pressure to connect with high

status firms to gain legitimacy. In environments that are not highly institutionalized, however, firms may consider connecting with firms that provide them increased efficiency (Westphal et al., 1997).

### WHAT ARE THE COMPARATIVE EFFECTS OF MULTIPLE NETWORKS ON FIRM PERFORMANCE?

The array of organizations with which a focal firm interacts constitutes an "organizational set" (Evan, 1966). This organizational set situates a focal firm into multiple types of networks. For example, a firm may maintain a horizontal network with its competitors, a vertical network with its suppliers, an institutional network with government agencies, and an interlocking directorate network with other firms. Although it is important to consider the effect of the overall configuration of all types of ties in a focal firm's "organizational set", the current network literature on inter-organizational relationships rarely takes more than one network into consideration (Gulati, 1998). How these different networks interact may affect firm performance (Blau, 1994). Gulati and Westphal (1999), for example, found that board interlock ties (one network) increased or decreased the likelihood of alliance formation depending on the content of relationship between CEOs and outside directors (a second network). In another study, Podolny et al. (1996) investigated how the positioning of firms in their product and status networks affects firm survival chances. They found that the life chances of a firm in an uncrowded niche increased monotonically with its status but the positive effect of status on an organization's life chance declined with the crowding of its niche. Taken together, these studies highlight the importance of future research examining the impact of multiple networks on firm performance.

### HOW DOES THE CONTENT OF THE ORGANIZATIONAL NETWORK, AND NOT MERELY ITS STRUCTURAL CHARACTERISTICS, AFFECT FIRM PERFORMANCE?

The current literature mostly focuses on the structural characteristics of a firm's network while ignoring the content of information flowing through the network. In research on interpersonal networks, the content of networks (such as friendship networks, task-advice networks, strategic information networks, etc) is explicitly assessed and found to interact with the structural characteristics of these networks to affect an individual's outcomes (Podolny and Baron, 1997). This logic can easily be extended to organizational network research. As we have already pointed out, organizations typically participate in various networks such as interlocking networks, alliance networks, and trade-association networks. It is possible that each of these networks has a different effect on firms depending upon the information they transmit. It could also be the case that the ties in each network are heterogeneous. For example, whereas research on interlocking directorates typically emphasizes the positive information benefits of the network for the focal firm, Gulati and Westphal (1999) found that some of these network ties negatively affect focal firms. When the board of directors exerted higher levels of independent control over management, challenging the CEO on strategic issues and monitoring CEO performance, the likelihood that an alliance would form between them

decreased. Conversely, when the relationship between the CEO and the board of directors was cooperative the likelihood that the two firms would form an alliance increased.

## New and Emerging Directions for Future Research

Incorporating relational accounts into traditional strategic management perspectives allows for a deeper understanding of the sources of interfirm differences in profitability. In this section, we focus on one inchoate and promising research area that blends together a network perspective with a more traditional strategic management perspective – the resource-based view of the firm (RBV). This view emphasizes how firms are able to combine rare and unique collection of resources within a single firm to create synergies and achieve a competitive advantage over competing firms (Barney, 1991; Dierickx and Cool, 1989; Rumelt, 1984; Wernerfelt, 1984). By exclusively focusing on the firm, researchers have paid scant attention to firms' external environments and, specifically, to how firms use their networks to develop and capitalize on these capabilities (Gulati, Nohria and Zaheer, 2000).

We propose that rents accrue to firms due to both their unique resource endowments and to the organizational network to which they belong. These unique resource endowments, or capabilities, specify the potential range of behavior and actions that firms may take. How these capabilities are developed and to what extent they can be leveraged, however, depends on the resources and constraints that the network environment provides. Some of these organizational ties may enable firms to take advantage of their capabilities and increase the firm's performance while other ties may inhibit the use of the firm's capabilities and decrease its performance (Gulati and Daldin, 2001).

To illustrate our argument, we examine two possible arenas, or capabilities, for inquiry: absorptive capacity and relational management and demonstrate how the effect of each for firm performance may be moderated in important ways by network factors. We chose only two capabilities in an effort to be illustrative and concise. We believe that network effects may moderate the influence of a number of other capabilities on firm performance as well.

### ABSORPTIVE CAPACITY

Absorptive capacity describes the ability of a firm to recognize the value of new, external information, assimilate it, and leverage it to its economic advantage (Cohen and Levinthal, 1990). The underlying premise of absorptive capacity is that the ability of firms to recognize valuable information and make use of it largely depends on the level of prior related knowledge. Absorptive capacity of a firm may also depend on the level of communication between its internal units, and on the interface of the units with the external environment (Cohen and Levinthal, 1990).

The concept of absorptive capacity is easily extended to the study of firms and their alliances. Without access to reliable sources of information even firms with the most developed routines for absorbing knowledge are hindered in their effort to appropriate value from their partnerships. However, by accessing their organizational network ties, firms are presented with a plethora of information sources about potential partners. For



example, by tapping in to this network, a firm can gain access to credible information about the “transparency” of potential partners, i.e. “the learning opportunity that each partner affords the other” (Doz and Hamel, 1998, p. 207). Also, firms can gauge the level of the other firm’s absorptive capacity by the presence of a dedicated alliance function that coordinates all alliance-related activity (Kale et al., 2000a). Thus, the network serves as a screening mechanism for firms in their search for partners and as a mechanism to limit search costs for potential partners.

Other informational advantages bestowed by networks relate to the trustworthiness of potential partners. Networks of prior alliances can enhance trust both by providing information to partners about each other’s reliability and by reinforcing a concern for reputation (Gulati, 1995a; Gulati, 1999; Burt and Knez, 1995). In particular, firms are weary of potential partners who have a reputation of being “learning racers.” By identifying “good partners,” firms are more likely to attain higher returns for their absorptive capacities than if they partnered with “learning racers.”

## RELATIONAL CAPABILITIES

Relational management refers to the ability to coordinate alliance activities, manage conflict, foster trust, and encourage information exchange between partners. It is an important capability given the intrinsic dependencies that exist among partners and the possibility of conflict between them. Poor conflict management skills obstruct the pursuit of integrative goals, destroy the relationship, and may ultimately dissolve the alliance (Kale et al., 2000b).

Well-developed relational management skills afford firms the capability to pursue integrative agreements. Firms with such capabilities are adept at searching for differences and interests in order to trade-off on these differences and create a larger pie. Developing routines for managing relationships notwithstanding, partnerships with firms that are incompatible in their relational management capabilities renders the capability itself useless (Gulati, Kumar, and Zajac, 2000; Gulati and Lawrence, 2000). For example, firms that prefer to settle conflicts through mediators may concede financial value to their partners who prefer settling disputes through expensive lawsuits. Thus, identifying partners with well-developed *and* compatible relational management capabilities is key.

As previously discussed, a network of prior ties can serve as a screening mechanism for firms in their search for partners and as a mechanism to limit search costs for potential partners. Information from both current and prior ties identifies the range of relational management styles that are available. By providing firms with the ability to screen those partners whose conflict management style is most compatible, focal firms can better make partnering decisions. Thus, the information that the network provides can be instrumental in shaping firms’ choice of partners and the formation of new alliances (cf. Gulati, 1995b; Gulati and Gargiulo, 1999).

Networks can also confer information about the trustworthiness of potential partners. Such a priori trust can facilitate the coordination of interdependent activities of alliances – a feature of relational management capabilities. Without the development of trust, the higher the interdependence (and consequently, the more activities to coordinate), the higher the expected coordination costs (Gulati, 1995a; Gulati and Singh,

1998). Entering alliances with partners who one trusts can also significantly alleviate concerns about coordination costs. Firms that trust each other are likely to have a greater awareness, or a willingness to become aware, of the rules, routines, and procedures each follows. Thus, trusting firms may have greater competence in transacting with each other, which makes the interface between them easier to manage.

An additional source of benefit that networks of prior ties can provide is information on “best-practices” with respect to managing relationships. Through its indirect ties, firms can learn about normative practices and appropriate behavior (Davis and Greve, 1997; Haunschild and Miner, 1997), generally, and about managing relationships, specifically. Westphal et al. (1997) for example, illustrate how firms can learn about Total Quality Management (TQM) practices through social network ties. They found that for early adopters of TQM, social networks help decision makers to identify which practices promote the firm’s (in this case, the hospital’s) strategic objectives. Similarly, firms in strategic alliances may refine their relational management skills by learning about the other firm’s respective skills.

## Connections Across Levels

While our focus was specifically on the organizational-level networks, the versatility of a network perspective and its implications for behavior in and of organizations is illustrated in the combined effort of the three network chapters in this volume (Baker and Faulkner, and Raider and Krackhardt). Baker and Faulkner, for example, introduce the interorganizational network box where multiple relationships between focal organizations, producers, and suppliers are arranged forming horizontal and vertical planes that correspond to organizational sets and organizational fields, respectively. In our chapter, we consider one type of network for an organization, such as its vertical or its horizontal network. Baker and Faulkner, however, may provide us with a framework for aggregating “up” from one type of network in which the organization is involved to a horizontal plane in which multiple networks intersect and which afford organizations with various forms of financial, institutional and information resources.

Raider and Krackhardt explore similar questions to ours but at a lower level of aggregation. For example, they explore how individual ties originate and what benefits accrue to network actors within organizations. While they emphasize both structural and relational (content) explanations on whether and how an individual’s network affects his or her behaviors and beliefs, we concentrate on structural factors only. We do, however, highlight that more research is needed in explaining how the content of ties in a network affects behavior and performance.

Two factors that are important at the organizational, interorganizational, and the intraorganizational levels of analysis are the relational content and the structural form of the respective networks. The relational aspects of a network include the content of the ties and the information and resources that flow through them. In contrast, the structural facets of a network focus on the position of the actor in the overall network and the benefits that are associated with such a position. The dyadic relationship of a focal actor with any other actor comprises the relational aspects of the network. This dyadic relationship as well as the other dyadic relationships of the same actor is the

basic unit that forms the organizational network of the actor. While the relational aspects highlight the importance of the content of ties, they do not provide information on how these dyadic ties relate to one another. Conversely, structural aspects of the egocentric network address how multiple dyadic relationships are patterned in aggregate but do not necessarily examine the content of those ties. Ultimately, the influence of networks depends on the independent and interactive influence of both their relational and structural aspects. This is evident from prior research which suggests that strong dyadic connections and a cohesive network provide fine-grained information and facilitate trust, while weak dyadic ties and a network rich in structural holes provide unique information and opportunities for focal actors. Relational and structural aspects might also be complementary such that in a structurally cohesive environment, weak ties may be more desirable than strong ties, whereas in a network rich in structural holes, strong ties may be more desirable.

Another possible linkage between the different levels of analysis is the tension between the interests of the individual actors and those of the organization. For example, interlocking networks are simultaneously interpersonal and interorganizational. Interlocks provide benefits to organizations while also furthering the interests of the managers. It is likely that these two interests may conflict and therefore a problem of agency may arise. Self-serving managers may compromise the effectiveness of the organization's interlock network. Social and organizational control mechanisms could be developed to prevent individual actors from pursuing their interests at the expense of the larger organization or society. The three chapters on networks in this volume together provide some valuable clues into the arena of multi-level networks, which remains a fertile terrain for future research.

## Conclusion

Over the past two decades there have been exciting theoretical and methodological developments for the study of networks at many levels of analysis. This chapter has focused on the organizational network. While some of the earlier network research focused on examining how organizational networks influence the behavior of organizations, such as tie formation, we have suggested that to truly comprehend the process of value creation through networks, we must understand how the different aspects of the network (e.g. centrality, configuration of ties in a firm's network and partner profiles) independently and simultaneously impact firm behavior and outcomes. The next wave of organizational network research should also continue to explore the boundary conditions of network effects by studying the contingencies under which they vary. By discovering these contingencies, or as Kuhn (1962) would put it, anomalies, the next generation of network scholars are likely to make exciting contributions to the advancement of a network perspective of organizations.

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