Annu. Rev. Sociol. 1998. 24:57–76

NETWORK FORMS OF ORGANIZATION

Joel M. Podolny and Karen L. Page
Graduate School of Business, Stanford University, Stanford, California 94305-5015;
e-mail: podolny_joel@gsb.stanford.edu

KEY WORDS: networks, organization, alliances, governance, trust

ABSTRACT

Initial sociological interest in network forms of organization was motivated in part by a critique of economic views of organization. Sociologists sought to highlight the prevalence and functionality of organizational forms that could not be classified as markets or hierarchies. As a result of this work, we now know that network forms of organization foster learning, represent a mechanism for the attainment of status or legitimacy, provide a variety of economic benefits, facilitate the management of resource dependencies, and provide considerable autonomy for employees. However, as sociologists move away from critiquing what are now somewhat outdated economic views, they need to balance the exclusive focus on prevalence and functionality with attention to constraint and dysfunctionality. The authors review work that has laid a foundation for this broader focus and suggest analytical concerns that should guide this literature as it moves forward.

INTRODUCTION

Over the past decade or so, sociological interest in network forms of organization has blossomed. Sociologists have become increasingly intrigued by the plethora of organizational configurations that fail to conform to traditional definitions of markets or hierarchies. Part of the interest in these alternative organizational arrangements is no doubt due to what some regard as their increased empirical prevalence (Kanter 1991).

0360-0572/98/0815-0057$08.00

While a number of scholars have convincingly challenged the view that these forms are more prevalent now than at other times in history (e.g., Clawson 1980, Granovetter 1995, Laumann 1991), it nonetheless remains true that changes in the US regulatory environment greatly facilitated the ability of US firms to engage in cooperative activities with their market competitors. For example, the National Cooperative Research Act enabled coordinated research and development activity across firm boundaries to an extent that had not been allowed in the past. Such regulatory changes were themselves a consequence of another empirical phenomenon in the 1980s that also increased scholarly interest in these network forms of organization: the worldwide competitive success of Japanese and, to a lesser extent, other Asian firms. Because Japanese firms seemed to rely extensively on network forms of organization, there emerged great interest on the part of both scholars and practitioners in understanding the extent to which that reliance was itself a determinant of competitive success (Lincoln et al 1996, Gerlach 1992, Orr et al 1991).

Yet, if part of the motivation was empirical, another part was that the existence, prevalence, and functionality of these organizational arrangements represented a challenge to economic views of organization that were becoming popular during this time period (Granovetter 1985). Prior to the middle 1970s, economists had largely regarded the organization as a black box that is to be understood as a production function converting inputs to outputs. In the middle 1970s and early 1980s, economists started to look inside the black box, and two perspectives in particular became quite prominent: principal-agent theory and transaction cost economics. At least when they first emerged, each perspective was grounded in a dichotomous view of economic organization: markets, on the one hand, and hierarchies, on the other.

While this dichotomous view was perhaps more implicit than explicit in the principal-agent tradition, it was quite explicit in transaction cost economics. For example, whereas Oliver Williamson, one of the leading figures of the transaction cost perspective, acknowledged that other forms of organization existed, he nonetheless asserted two points. First, the alternatives to pure markets and pure hierarchies can be interpreted as intermediate or hybrid forms, combining elements of markets and hierarchies (Williamson 1991). Second, the distribution of organizations along the markets-hierarchies continuum is "thick in the tails" (Williamson 1985). That is, pure types tend to prevail over the mixed forms.

Sociological research on network forms of organization sought to challenge both of these points. First, sociologists argued that network forms of organization could not be considered hybrids of markets or hierarchies; rather, network forms of organization represented a unique alternative possessing its own logic (Powell 1990). Second, sociologists argued that the network form of organization has a number of distinct efficiency advantages not possessed by

pure markets or pure hierarchies, and because of these efficiency advantages, network forms are quite prevalent (Bradach & Eccles 1989).

In the following pages, we review and highlight a number of important insights into the nature and functionality of the network form of organization. At the same time, we question whether the emphasis on the functionality of the network form has perhaps gone too far. In elucidating functions, sociologists are prone to neglect constraints that underlie the formation of network forms of organization, problems that arise in their governance, and boundary conditions on their functionality. We may have a good understanding of why economic actors want to utilize network forms of organization, but we have less understanding of why they do not. That is, we have little understanding of the reasons why variance exists in the utilization of network forms of organization or why a given focal actor would pursue one network partner and not another.

WHAT IS A NETWORK FORM OF ORGANIZATION?

From a purely structural perspective, the trichotomy among market, hierarchy, and network forms of organization is a false one. Markets and hierarchies are simply two pure types of organization that can be represented with the basic network analytic constructs of nodes and ties (Laumann 1991). For example, one might operationalize a spot market as a population of isolates. Each market actor is a node that lacks any ties to the other actors/nodes. One could operationalize a hierarchy as a centralized network in which the vast majority of ties flow to or from one particular node. In effect, from a structural perspective, every form of organization is a network, and market and hierarchy are simply two manifestations of the broader type.

However, when considered as a form of governance, the network form can be distinctly characterized. *We define a network form of organization as any collection of actors ($N \geq 2$) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange.* In a pure market, relations are not enduring, but episodic, formed only for the purpose of a well-specified transfer of goods and resources and ending after the transfer. In hierarchies, relations may endure for longer than a brief episode, but a clearly recognized, legitimate authority exists to resolve disputes that arise among actors.

This definition of a network form of organization includes a wide array of joint ventures, strategic alliances, business groups, franchises, research consortia, relational contracts, and outsourcing agreements. This definition excludes most pure market arrangements such as short-term contracts or spot market transactions, and it excludes employment relations. Yet, while it is

tempting to provide a list of formal organizational arrangements that can or cannot be categorized as network forms of organization, any such list would obscure important variance within formal organizational types. For example, consider syndicates—collections of (typically financial) actors that pool assets to support a high-risk endeavor in exchange for profits from that endeavor. Syndicates can differ in the extent to which authority for managing the syndicate is vested in one actor, and they can differ in terms of their time horizon. In fact, an important trend among investment banks in the twentieth century was the increasingly transitory character of syndicates for the underwriting of securities (Carosso 1970, Eccles & Crane 1987). Such decentralization affected the extent to which this particular interorganizational arrangement conformed to the definition of the network form.

More generally, a significant sociological finding is that many of the economic arrangements that are formally labeled markets and hierarchies may conform empirically to the definition of network organization laid out above. For example, in his work on transfer pricing within organizations, Eccles (1985) discusses a number of cases in which organizational divisions lack a legitimate authority to set the price for the internal transfer of goods and arrive at prices based on negotiation. Therefore, while we provide a list of formal organizations typically regarded as manifestations of network forms of organization for the sake of illustration, we emphasize that there is no clear mapping of formal organizational arrangements onto the network form.

Even though network forms of organization cannot be identified according to some limited set of labels for formal organizational arrangements, a number of scholars have argued that network forms of organization can be characterized by a distinct ethic or value-orientation on the part of exchange partners. In his analysis of long-term buyer-supplier relations among Japanese firms, Ronald Dore (1983) points to what he calls the "spirit of goodwill" underlying these relationships. The central elements of this spirit of goodwill are a commitment to use "voice" rather than "exit" (cf. Hirschman 1970) to resolve disputes and a high level of trust between the parties. The buyer tries to work with the seller to address any deficiencies in the seller's performance rather than simply moving to another seller. Buyer and seller are both willing to make relationship-specific investments without contractual guarantees protecting those investments because each party expects that the other will not use the relationship-specific investments to its own advantage. Similarly, Powell (1990) argues that a norm of reciprocity is a guiding principle underlying network forms of organization. Each member of the network feels a sense of obligation to the other party or parties rather than a desire to take advantage of any trust that may have been established. In his analysis of business groups, Granovetter (1995) also points to a high level of trust and obligation among members of the group. He argues that a distinctive feature of such groups is that

they constitute a moral community insofar as "trustworthy behavior can be expected, normative standards understood, and opportunism foregone." Finally, in a treatise on what he calls "small firm networks," Perrow (1993) identifies trust as a critical element of small firm production networks.

Probably the most vivid illustration of trustworthiness and obligation in a network form of organization comes from Uzzi's (1997) examination of subcontracting relationships in the New York garment industry. Uzzi is particularly interested in what he refers to as "embedded ties," strong enduring relations between manufacturers and subcontractors. He describes the case of a manufacturer that had decided to move all of its production facilities overseas to Asia. Because of this upcoming move, the manufacturer would no longer be relying on its subcontractors in New York. He writes:

> As a result [of this move], this manufacturer had strong incentives not to tell its contractor that it intended to leave. Doing so put it at risk of receiving low-quality goods from contractors who now saw the account as temporary and had to redirect their efforts to new manufacturers who could replace the lost business. Yet the CEO of this manufacturer personally notified his embedded ties, because his relationships with them obliged him to help them adapt to the closing of his business, and his trust in them led him to believe that they would not shirk on quality. Consistent with his account, one of his contractors said that the jobber's personal visit to his shop reaffirmed their relationship, which he repaid with quality goods. This same manufacturer, however, did not inform those contractors with which it had arms-length ties. (Uzzi 1997, p. 55)

This example is noteworthy because there exists no shadow of the future to ensure cooperation in the present. Moreover, because the manufacturer is moving overseas, it has no need to preserve its local reputation. Cooperation does not arise as a route to future gains.

While there may be subtle differences in each author's understanding of the trusting ethic guiding economic exchange in network forms of organization, these subtle differences need not concern us here. What is important is that this more trusting ethic is one of the defining elements of a network form of governance, and the network form of governance is therefore not reducible to a hybridization of market and hierarchical forms, which, in contrast, are premised on a more adversarial posture.

To be sure, it is probably true that a moral community or spirit of goodwill is not a functional necessity for a network form of organization to exist. If two economic actors wish to enter into an enduring relation and lack a legitimate authority to resolve disputes, they may enter into a long-term contract in order to place restrictions on the opportunistic behavior of one another. In the contract, they can include provisions that allow for anticipated changes or allow for recontracting at a later date based on unanticipated changes. However, in

the face of unexpected changes to the opportunities and constraints confronting parties to the exchange, an exchange relation governed by a contract with provisions only for anticipated changes will generally be less flexible than an exchange governed by a norm of reciprocity. Moreover, a contract allowing for recontracting at a later date based on unanticipated changes to circumstance requires some level of trust that the other party will act in good faith at the time of recontracting. In short, while a long-term contract may represent a substitute for what some have identified as a moral community, spirit of goodwill, or norm of reciprocity, such a contract is not likely to allow for the same flexibility and adaptability as these ethics of exchange.

FUNCTIONS OF NETWORK FORMS OF ORGANIZATION

An increasingly large volume of research has sought to highlight the functionality of network forms of organization. Sociologists and organizational scholars have claimed that network forms allow participating firms to learn new skills or acquire knowledge, gain legitimacy, improve economic performance, and manage resource dependencies. In addition, the widespread use of network forms of organization may have unintended social welfare benefits. We consider each of these proposed advantages separately.

Learning

A number of scholars have emphasized the learning benefits of network forms of organization (Dore 1983, Powell 1990, Uzzi 1997, Hamel 1991). Network forms of organization foster learning because they preserve greater diversity of search routines than hierarchies and they convey richer, more complex information than the market. As Powell (1990) writes, "the most useful information is rarely that which flows down the formal chain of command in an organization, or that which can be inferred from price signals. Rather, it is that which is obtained from someone you have dealt with in the past and found to be reliable" (p. 304).

There are two ways in which network forms of organization can foster learning. First, they can encourage learning by promoting the rapid transfer of self-contained pieces of information. In this view, network ties are conduits or channels (e.g., Contractor & Lorange 1988b, Root 1988, Hamel 1991, Kogut 1988b). Hamel (1991) is perhaps the most explicit in examining how interfirm collaborations provide participating firms with opportunities to internalize one another's skills. Conceiving firms as portfolios of skills, Hamel argues that network forms of organization are less a compromise between market and hierarchy (Grant 1996), to use Williamson's (1975) terminology, and more an alternative to other modes of skill acquisition. This understanding of learning

through networks is quite consistent with some of the early network research on information transfer. For example, in Granovetter's (1974) seminal research on job search, information on jobs resides at nodes and is transferred through the ties linking nodes.

Alternatively, as Powell & Brantley (1992) contend, network forms of organization may foster learning by encouraging novel syntheses of information that are qualitatively distinct from the information that previously resided within the distinct nodes. That is, rather than simply facilitating the transfer of information between two nodes, the existence of an enduring exchange relation may actually yield new knowledge. In effect, the network becomes the locus of innovation rather than the nodes that comprise the network.

In a study of the biotechnology industry, Powell et al (1996) attempt to test empirically the claim that when the knowledge of an industry is broadly distributed and rapidly changing, the locus of innovation will be found in interorganizational networks of learning, rather than in individual firms. In their study, the authors find some evidence of a liability of unconnectedness; strong-performing biotechnology firms have larger, more diverse alliance networks than do weak-performing firms. While this result is consistent with the authors' hypothesis, it is also consistent with a number of others. First, the link between connectedness and performance does not necessarily mean that learning and innovation constitute the intervening process between structure and performance. As we discuss further below, network ties may serve a number of other functions such as managing resource dependencies or enhancing legitimacy, both of which have positive effects on performance. Second, even if the tie count reflects learning, it is not clear whether ties are conduits for information flow or are actually loci of innovation that would not arise in the absence of the ties.

Using a firm's position in a network of patent citations as a measure of technological position, Stuart & Podolny (1996, 1997) attempt to establish a closer connection between alliances and learning. The authors illustrate how patent citations can be used to establish (*a*) the technological distance of a firm from its alliance partners and (*b*) the extent to which a firm's current inventions differ considerably in content from its past inventions. Stuart & Podolny (1997) find that the greater a firm's technological distance from its alliance partners, the higher the likelihood that the focal firm produces inventions that are considerably different in content from its previous inventions. Such a finding provides more direct support for the learning hypothesis, but it does not distinguish between the two means of learning identified above.

To know whether alliances yield novel syntheses, we would need to know not only whether a firm's inventions were significant departures from past inventions but also whether the firm's inventions were qualitatively distinct from its alliance partners' past inventions. If alliances yield inventions that are

qualitatively distinct from the inventions of either partner, then we can more confidently assert that the locus of innovation is in the network itself rather than the nodes of that network. While such research has not yet been conducted, it seems a straightforward extension of the current work using patent citations as proxies for technological distance.

Legitimation and Status

A number of scholars have argued that if an actor's partner in a network form of organization possesses considerable legitimacy or status, then the actor may derive legitimacy or status through the affiliation. This legitimacy or status may in turn have a number of positive economic benefits for the actor, ranging from survival to organizational growth to profitability. For example, in a study of daycare centers, Baum & Oliver (1992) find that a tie to a legitimate institutional actor, such as a church or governmental entity, has a positive effect on the life chances of an organization. In a study of the investment banking industry, Podolny & Phillips (1996) find that the higher the status of a bank's management partners in underwriting syndicates at time t, the greater its status growth between time t and $t + 1$. This enhanced status, in turn, has positive economic advantages for the organization (Podolny 1993).

In one of the more compelling demonstrations of the economic value of ties to legitimate or high-status actors, Stuart et al (1997) examine the economic effects of the interorganizational networks of privately held biotechnology firms. These authors find that an affiliation with a prominent alliance partner increases the market value of the biotechnology firm. What is particularly notable about this study is that the authors seek to empirically disentangle the legitimating or status-enhancing effects of these ties from the resources that would flow from such ties. The authors argue that the legitimating or status-enhancing effects of an affiliation with a prominent actor should vary with the age of the start-up. When a start-up is young, there is considerable investor uncertainty about its quality. As the start-up ages, this uncertainty inevitably declines since investors have more history on which to base their inferences. If ties to prominent actors are primarily symbolic in their significance, then the effect of such ties should be greatest for the young start-ups, whose quality is most uncertain. Conversely, if the ties to prominent actors are simply proxies for superior resource flows, then the effect should not vary with age; older and younger firms should benefit equally from superior resource flows. Consistent with an interpretation of these ties as carriers of legitimacy, Stuart and his associates find that the effect of affiliations varies inversely with the age of the start-up.

Finally, Stark (1996) offers one of the most intriguing accounts of the legitimating effects of network ties. Stark examines the development of organizational forms in postsocialist Hungary. In this transitional period, multiple socioeconomic and sociopolitical orders exist simultaneously, with different and

sometimes contradictory bases on which organizations can lay legitimate claims to resources. Decentralized networks of organizations emerge, and assets and liabilities are reallocated within the network in such a way that the network represents a hedge against uncertainty in the political and economic environment. In Stark's account, status and legitimacy are acquired not by virtue of a tie to an actor that is generally regarded as high status or legitimate. Rather, legitimacy is attained through a distribution of liabilities and assets within the organizational network that is robust with respect to the multiple, contending sociopolitical and socioeconomic orders.

Whereas all of the above accounts of legitimacy emphasize benefits that flow from one network partner to another, Baum & Oliver (1991, 1992) make the additional claim that a focal organization's tie to a legitimate actor has positive externalities for others in the focal organization's population. A tie to a legitimate actor outside of the organizational population helps to institutionalize the population as a whole. Sharfman et al (1991) make a similar argument.

Economic Benefits

In elaborating functions fulfilled by the network form of organization, it is important not to overlook the direct economic benefits of this form in terms of costs and quality. Williamson (1991) lays out conditions under which network forms of organization lower transaction costs, though it bears repeating that the transaction cost perspective does not see trusting or altruistic behavior as particularly germane to the network form of organization. A number of economists and strategy scholars attempt to assess empirically the relevance of the transaction cost perspective to the network form of organization (Hennert 1988, 1991, Zajac & Olsen 1993, Parkhe 1993, Buckley & Casson 1988, Stuckley 1983). Perhaps because they seek to elaborate a view of network forms of organization that is distinct from economic views, sociologists downplay or reject the role of transaction costs in the adoption of the network form (e.g., Powell et al 1996, Lazerson 1993, Bradach & Eccles 1989). Moreover, when sociologists see transaction costs reduced through the network form, they emphasize the reliance on trust rather than contractual provisions as the primary basis on which transaction costs are reduced (e.g., Dore 1983).

Perhaps more importantly, sociologists stress quality advantages rather than costs as the primary economic benefit. For example, comparing long-term or embedded subcontracting relations to arms-length subcontracting relations, Uzzi (1997) argues that the former are more conducive to high-quality production because they enable richer communication between buyer and supplier on issues pertaining to quality.

Some sociologists also claim that one of the economic benefits of the network form of organization is the adaptability of this form to unanticipated en-

vironmental changes (Powell 1990, Kanter 1991). By fostering greater communication than the market does, network forms of organization facilitate greater coordination in the face of changes whose significance cannot be completely conveyed or understood through price signals. At the same time, because the boundaries of network forms of organization are generally easier to adjust than the boundaries of hierarchies, it is easier to modify the composition of network organizations to respond to those changes (Sorenson 1997).

Other Benefits of the Network Form of Organization

In addition to the benefits just listed, at least two other advantages are emphasized by sociologists and organizational scholars. First, following Selznick's (1949) initial insights regarding organizational cooptation, resource dependence scholars posit that organizations can alleviate sources of external constraint or uncertainty by strengthening their relationship with the particular sources of dependence. Pfeffer & Nowak (1976) apply this general insight to the formation of joint ventures. They find that that oligopolistic industries (i.e., industries of intermediate concentration) have the highest proportion of firms engaged in within-industry joint ventures. Since oligopolistic industries are those in which firms face the highest uncertainty about the actions of their competitors, Pfeffer & Nowak take this finding as evidence that joint ventures are a means for reducing that uncertainty. Second, Perrow (1993) identifies a number of social welfare benefits with what he refers to as small firm networks, or networks of small producers. He argues that in comparison to larger, bureaucratic forms of organization, small firm networks provide individuals with greater autonomy, lead to less inequality in the distribution of wealth, and foster a greater sense of community.

WHY ARE THERE MARKETS AND HIERARCHIES?

While this list of functions or benefits of the network form of organization is perhaps not exhaustive, it captures the vast majority of those that sociologists and organization scholars have identified. This research has yielded some important insights. Yet, a review of the work does raise an important question: Why do not all actors within an organizational population rely exclusively on the network form? That is, if a network form of governance can result in superior learning, enhanced legitimacy and prestige, greater control over the external environment, and economic benefits, why are there any markets and hierarchies remaining? In effect, this attention to the functionality of network forms of organization explains why economic actors rely on network forms of organization, but it does not explain why they do not.

To be sure, this work potentially provides some understanding of cross-industry or cross-population variance in the utilization of network forms of or-

ganization. For example, to the extent that network form fosters learning, the form should be more prevalent in industries where knowledge is broadly dispersed and knowledge is rapidly updated (Powell & Brantley 1992). Based on this argument, one would expect the form to be more prevalent in the biotechnology industry than in the steel industry, for example.

But what explains the variance in the utilization of this form within the biotechnology industry? More generally, what are the determinants of intrapopulation or intraindustry variance in the utilization of network forms of organization? This concern with intrapopulation variation in the utilization of network forms of organization can be framed as two research questions. First, what determines the extent to which an economic actor chooses to rely on a network form of governance? Second, to the extent that an economic actor wishes to employ a network form of governance, what are the constraints on the pattern of network relationships that the actor may form?

In an examination of relationships between corporations and investment bankers, Baker (1990) attempts to answer this first question. Baker distinguishes three market interfaces that can link an investment bank to its corporate issuers: a relationship interface involving long-term ties with at most a few banks; a transaction interface involving short-term ties with numerous banks; and a hybrid interface representing an intermediate category between the other two. The relationship interface obviously corresponds to the network form of governance, whereas a transactional interface corresponds to market governance. Using a number of measures of a corporation's power, such as its size or its availability of resource alternatives, Baker finds that a more transactional orientation is associated with greater corporate power. Only those corporations that are weaker and more dependent on investment banks adopt the relationship interface.

These findings are important insofar as they provide some initial insight into why actors would adopt a network form of organization. However, further work must be done to integrate these findings with the literature emphasizing the functionality of the network form of governance. In Baker's work, corporations only adopt the network form when they are too weak to adopt an alternative, more transactional interface. If network forms of organization are functional for the reasons elaborated above, then it is difficult to understand why only weak corporations would prefer this form. One possibility is that powerful firms are in less need of the benefits yielded by alliances. However, given the broad set of advantages claimed for the network form of governance, this proposition seems difficult to sustain. Another possibility is that unique features of the investment banking industry limit the benefits of the network form of organization. This conclusion, too, is difficult to sustain in light of research highlighting functional benefits of the relationship interface in this industry (Eccles & Crane 1987).

While not necessarily directed toward the specific topic of network forms of organization, ecological arguments on inertia (Hannan & Freeman 1989) may nonetheless provide some analytical leverage in understanding intrapopulation variance in the adoption of this form. Drawing on Stinchcombe's (1965) arguments about organizational imprinting, ecologists argue that important features of an organization's structure are established early in an organization's history, and these features can be difficult to alter. For example, older firms in the computer industry such as IBM or DEC are vertically integrated. At the time of their entry into the computer industry, such firms had strong functional reasons for a high level of vertical integration. An absence of efficient markets for various components of computers drove firms to integrate vertically. In contrast, younger computer firms such as Sun Computers, Compaq, and Silicon Graphics are vertically disintegrated, relying extensively on outsourcing relationships. These younger firms emerged during a time when efficient markets existed for many of the various components within computers. Because of the difficulties involved in significant organizational restructuring, older firms have been either unable or unwilling to modify their vertically integrated structures to take advantage of the more efficient markets for computer components.

A third basis for variance in the propensity to adopt the network form of organization is nationality. Cultural and legal differences across countries can be the basis for differences in the propensity of organizations to adopt network forms of organization. Dore (1983), for example, argues that the ethic underlying a network form of organization is more consistent with a collectivist orientation and thus more prevalent in countries where individuals subscribe to the collectivist orientation. In Italy, tax laws favor small employers. Such laws greatly encourage the formation of small-firm networks over the formation of large hierarchies.

Power, conditions at time of founding, and nationality have thus been identified as three factors that potentially affect intrapopulation or intraindustry variance in the adoption of the network form. Yet, of these three factors, only two can explain within-country variance, and of these two, one is difficult to reconcile with the view that network organizations are—at least at times—functional and desirable rather than a response to a weakened power position. Moreover, the organizational imprinting argument does not by itself explain why network forms were more prominent in some periods than in others. Further research obviously needs to be undertaken to explain differences in the propensity of economic actors to adopt the network form of organization.

We now shift from work focusing on the propensity of an actor to adopt a network form to work that seeks to explain the pattern of network ties that arise among a population of actors. Some research suggests that the pattern of relations follows a functional logic. That is, a network tie arises when it is most

likely to foster one of the functions listed above. For example, Lincoln et al (1992) examine transaction cost and resource dependence motivations underlying the pattern of ties among leading Japanese firms. In addition, implicit in Hamel's (1991) assertion that firms form alliances to obtain skills is a hypothesis that a firm will form alliances with those that are most able to provide the skill set needed by the firm.

Though there is value in linking the functions of the network form of organization to the pattern of ties that arise among a population of actors, a central feature of the sociological perspective is its attention to constraints on action that lie outside of the purposive behavior of individual actors. Even if a particular network tie would convey one of the functional advantages listed above, there may still be reasons why a dyad would be unable to form an enduring exchange relation in the absence of a legitimate authority. Nevertheless, despite the centrality of the constraint emphasis to the sociological perspective, there is surprisingly little work that highlights these constraints.

Mowery et al (1996) draw on Cohen & Levinthal's (1989, 1990) concept of absorptive capacity to explain the pattern of technology-sharing alliances. They contend that a firm's ability to absorb knowledge from a potential partner is contingent on the stock of related knowledge. Therefore, a firm is unlikely to enter into an alliance with another firm whose technology is highly different from its own. At the same time, the authors assert that a firm is unlikely to enter into an alliance with a partner that possesses redundant technology. Accordingly, the authors hypothesize and find evidence that a firm is most likely to form technology-sharing alliances with a firm whose technology is at an intermediate technological distance.

Podolny (1994) examines the pattern of syndicate relations among investment banks. He argues that in markets where there is high uncertainty about the quality of a good or service that an actor brings to market, an actor's status may limit the potential exchange partners to which the actor has access. High status actors must avoid affiliating with low status actors in order to avoid risking a loss of their own status, and low status actors are thereby constrained in their ability to enter into exchange relations with high status actors.

Gulati (1995) offers probably the most general account of the constraints underlying the pattern of network tie formation. In a multi-industry examination of alliance formation, he argues that one of the most important determinants of the pattern of alliances at time t is the preexisting pattern of alliances at $t-1$. More specifically, Gulati hypothesizes that the probability that points in a dyad will enter into an alliance with one another is a function of past direct contact between the pair and the presence of indirect network connections through others in the industry. Gulati asserts and finds evidence that these indirect ties serve both a referral and a control function. They provide information on each potential partner's reliability, and they represent a source of peer sanc-

tioning when one party does not act in good faith in the context of the alliance. Powell et al (1996) also develop some similar hypotheses as to how the previous pattern of ties predicts the existing patterns of ties. Framing these results in terms of constraint, a firm will generally be unwilling or unable to form a tie with another if it lacks some indirect connection to that other.

Of course, any endogenous explanation of tie formation, in which ties at one time period lay a foundation for ties at a subsequent time period, begs the question: What are the determinants of the initial ties in which a firm is involved? Especially in rapidly growing industries like biotechnology, where so many new organizations enter each year without ties, the presence of previous direct or indirect ties cannot be a critical explanatory variable in understanding the distribution of ties within a population. Gulati & Gargiulo (1997) have started to respond to this concern by situating the endogenous dynamic in a broader evolutionary framework.

As work on constraints underlying the pattern of network relations moves forward, it will be important to attend to two observations. First, the pattern is a function not only of the formation of new ties but of the persistence of established ties, and, second, constraints operate not only on tie formation but also on tie persistence. For example, consider Gulati's finding that a firm's ability to form an alliance with another is contingent on the presence of previously existing indirect ties to that firm. To the extent that this claim is true, a firm has an incentive to preserve an alliance simply to help lay the foundation for future alliances with others even if that focal alliance provides no tangible benefit itself. Moreover, given the importance of trust and obligation to the successful operation of network ties, there are inevitably limits on how much an actor can alter its network in response to changes in self-interest (Portes & Sensenbrenner 1993).

The existence of constraints on the breaking of ties has clear, specific implications for the previously mentioned claims regarding the adaptability of network forms of organization. If there are reputational costs from breaking ties, then there are at least some circumstances in which market and hierarchical forms of governance, which are not premised on trust and obligation, will be more adaptable than a network form, which is. More generally, if there are constraints on the dissolution of ties, then it seems quite reasonable to conclude that network ties can often outlive the duration of their functionality. A network tie that may have originated for strongly functional reasons persists only for the purpose of preserving reputation.

WHY ARE THERE NO NETWORK FAILURES?

This discussion of constraints on the dissolution of network ties naturally leads to another topic that has received scant attention in sociological research on

network forms of organization: the dysfunctionalities that arise through the operation of the network. One possible reason for the inattention to dysfunctionalities is that network forms of organization may indeed constitute a superior organizational form. A number of scholars (e.g., Kanter 1991, Powell 1990, Perrow 1993) seem at least implicitly to make the claim that alliance capitalism is simply more efficient and effective than a capitalism premised on arms-length transactions among large hierarchies, especially when efficiency and efficacy hinge on the coordination of a complex array of elements.

However, this enthusiasm for network forms of organization seems difficult to reconcile with an important fact: An extremely large fraction of network forms of organization do not perform the function for which they were designed (Kogut 1988a, Killing 1982, Inkpen 1996). While there are essentially no scientific studies of the failure rate of network forms of organization, journalistic and managerial sources are essentially unanimous in the conclusion that an extremely large proportion of at least one common type of network organization—strategic alliances—result in failure. For example, the Boston Consulting Group, which undertook a study of the performance of alliances in the airline industry—an industry with 401 alliances in 1995—estimated that fewer than 40% of regional alliances and fewer than 30% of international alliances should be considered successes (*The Economist* 1995). Similarly, Savona (1992) refers to a study finding that the average joint venture lasts less than 3.5 years and that fewer than one third of joint ventures are considered successes.

Obviously, such findings must be supplemented with more scientific analyses. Enthusiasts for the network form of organization could perhaps respond to such a finding by observing that the dysfunctionality of a particular form is relative, and one would need to compare the failure rate of alliances to the failure rate of other organizational structures. Fair enough. Such an analysis would clearly be of value to establishing the relative performance of the network form of governance.

However, even in the absence of such a study, it seems important to pay more attention to conditions under which network forms of organization meet their objective and those under which they do not. While there is some acknowledgment that networks do fail (e.g., Powell & Smith-Doerr 1994), such acknowledgments have not yet had a significant impact on the focus of empirical research. We suspect that one of the reasons that there has been little work on this topic is that it is quite difficult to obtain longitudinal data on the performance of a population of network organizations. Moreover, for network forms such as strategic alliances, data on dates of founding are generally much better than on the dates of failure. Failure rarely occurs on a specific date, and even if an alliance is formally terminated on a particular date, the participating

actors often do not publicly announce the termination. As a consequence, researchers cannot rely on archival data to establish failures.

One initial attempt to reconcile the concern with functionality and dsyfunctionality is Uzzi (1996, 1997). He argues that embedded transactions are more functional than arms-length transactions, though he posits an inverted U-relationship between embeddedness and performance. That is, while embedded transactions are superior to unembedded ones, it nonetheless remains possible for an organization to depend too much on embedded ties. If a disproportionate number of an organization's ties are embedded, then the organization becomes trapped by these relationships. However, even here, dysfunctionality is at the level of an actor's entire network rather than at the level of individual ties, and the above data on failure are at the tie level, not at the level of the entire network.

Some research suggests that the ability to operate in a network form of organization is a skill or capability that must be learned, and as a consequence the likelihood of failure is related to the experience of the actors with the form. Acknowledging the difficulties inherent in working with unrelated entities, Powell & Brantley note that "successful firms are those who learn most rapidly how to gain from external linkages without creating enemies or behaving opportunistically" (1992, p. 371). That is, the ability to exploit the substantive knowledge gained through network relationships without killing the proverbial goose can be viewed as an important capability in its own right (Levitt & March 1988), to be learned through experience in network forms of organizations (Powell et al 1996, Mody 1993, Gulati et al 1994, Gulati 1995, Westney 1988, Balakrishnana & Koza 1993). The implication of this research is that the likelihood that a network organization will fail decreases with the partners' experience with the form.

In addition to this general insight on the importance of experience, some qualitative field research provides clues and insights into the behavioral determinants of success and failure at the dyad level (e.g., Doz 1996, Liebeskind et al 1996, Parkhe 1991, Larson 1992). For example, Doz (1996) argues that a number of factors such as the level of task integration, similarity of organizational cultures, and commonality of organizational goals affect the ability of alliance partners to learn from one another. Parkhe (1991) also looks at learning and adaptation as critical processes underlying the longevity and effectiveness of alliances, focusing in particular on how the firms' diversity affects learning and adaptation.

Unfortunately, with the exception of Larson's (1992) study, these field studies tend to fall outside of the sociological literature. As a result, they do not link up with the theoretical constructs that have been of greatest interest to sociologists. Further work needs to be done to establish a more substantial linkage. Especially given the importance of trust in sociological accounts, it would

be valuable to have some more direct insight into the social and psychological processes by which trust in network forms of organization is built up and breaks down. Though their analysis is more at the level of interpersonal networks than network organizations, the work of Burt & Knez (1995) provides a model for such an examination.

One could perhaps draw on some of the research on constraints to develop hypotheses about dysfunctionalities. For example, as noted above, Gulati (1995) demonstrates that the probability that an alliance will form between two actors is a function of the indirect connections that these actors have to one another. These indirect connections are conduits for information about reputation and peer control. We suspect that these should be relevant not only to the likelihood of formation but also to the likelihood of failure. That is, less information about reputation and less peer control increase the likelihood that a strategic alliance will end in failure.

Yet, regardless of the direction pursued in future research, it is clear that more attention must be given to the factors that determine the success and failure of network forms of organization. Once the possibilities for failure are acknowledged, one can no longer simply add up the number of network ties and assume that more ties imply greater learning or greater legitimacy. It seems quite plausible to assume that a failed tie with a high status or legitimate actor may have more adverse consequences than no tie at all.

CONCLUSION: A BALANCED APPROACH TO THE NETWORK FORM

A large volume of research has documented the functionality of the network form of organization. As noted in the introduction, we suspect that the initial impetus for this concern with the functionality of the network form was to critique and challenge economic views of organization, as is made quite explicit in the writings of Granovetter (1985) and Powell (1990). When explicitly linked to a critique, the primary objective was to show that at least under some conditions, nonmarket, nonhierarchical forms or organization are functional. However, as the literature has evolved, it has become decoupled from such an explicit critique. Such a decoupling seems a necessary and important stage in the evolution of this literature; however, in moving away from the explicit critique, researchers must counterbalance the focus on prevalence and functionality with an equally strong focus on constraint and dysfunctionality. Otherwise, the literature runs the risk of succumbing to a naive functionalism.

In moving toward this more balanced consideration of the network form, it is important to recognize that the network form represents one of three alternative forms of governance, not one of two. In the past, sociologists have typically made pairwise comparisons when evaluating network organizations. For

example, when discussing the richness of information conveyed through network ties, the comparison is to arms-length contracts. When discussing the autonomy of the network form, the comparison is to hierarchy. However, does the network form provide richer information than hierarchies and more autonomy than the market? Only by considering all three forms simultaneously can objective assessments of the strengths and weaknesses of the form be made.

ACKNOWLEDGMENTS

The authors wish to thank Woody Powell for helpful comments on this review.

Literature Cited

Baker WE. 1990. Market networks and corporate behavior. *Am. J. Sociol.* 96:589–625

Balakrishnana S, Koza MP. 1993. Information asymmetry, market failure and joint ventures: theory and evidence. *J. Econ. Behav. Org.* 20:99–117

Baum JAC, Oliver C. 1991. Institutional linkages and organizational mortality. *Admin. Sci. Q.* 36:187–218

Baum JAC, Oliver C. 1992. Institutional embeddedness and the dynamics of organizational populations. *Am. Sociol. Rev.* 57: 540–59

Bourdieu P, Coleman JS, eds. 1991. *Social Theory for a Changing Society.* Boulder, CO: Westview

Bradach JL, Eccles RG. 1989. Price, authority, and trust: from ideal types to plural forms. *Annu. Rev. Sociol.* 15:97–118

Buckley PJ, Casson M. 1988. A theory of cooperation in international business. See Contractor & Lorange 1988a, pp. 31–53

Burt RS, Knez M. 1995. Kinds of third-party effects on trust. *Ration. Soc.* 7:255–92

Carosso VP. 1970. *Investment Banking in America: A History.* Cambridge, MA: Harvard Univ. Press

Clawson D. 1980. *Bureaucracy and the Labor Process: The Transformation of U.S. Industry, 1860–1920.* New York: Monthly Rev.

Cohen WM, Levinthal DA. 1989. Innovation and learning: the two faces of R&D. *Econ. J.* 99:569–96

Cohen WM, Levinthal DA. 1990. Absorptive capacity: a new perspective on learning and innovation. *Admin. Sci. Q.* 35:128–52

Contractor FJ, Lorange P, eds. 1988a. *Cooperative Strategies in International Business.* Lexington, MA: Lexington Books

Contractor FJ, Lorange P. 1988b. Why should firms cooperate: the strategy and economic basis for cooperative ventures. See Contractor & Lorange 1988a, pp. 3–30

Dore R. 1983. Goodwill and the spirit of market capitalism. *Br. J. Sociol.* 34:459–82

Doz YL. 1996. The evolution of cooperation in strategic alliances: initial conditions or learning processes? *Strat. Manage. J.* 17: 55–83 (Sum. Suppl.)

Eccles RG. 1985. *The Transfer Pricing Problem.* Lexington, MA: Lexington Books

Eccles RG, Crane DB. 1987. Managing through networks in investment banking. *Calif. Manage. Rev.* 30:176–95

Editors. 1995. Flying in formation. *The Economist* 336(7924):59–60

Gerlach ML. 1992. *Alliance Capitalism: The Social Organization of Japanese Business.* Berkeley: Univ. Calif. Press

Granovetter MS. 1974. *Getting a Job; a Study of Contacts and Careers.* Cambridge, MA: Harvard Univ.

Granovetter MS. 1985. Economic action and social structure: the problem of embeddedness. *Am. J. Sociol.* 91:481–510

Granovetter MS. 1995. Coase revisited: business groups in the modern economy. *Ind. Corp. Change* 4:93–131

Grant RM. 1996. Prospering in dynamically-

competitive environments: organizational capability as knowledge integration. *Org. Sci.* 7:375–87
Gulati R. 1995. Social structure and alliance formation patterns: a longitudinal analysis. *Admin. Sci. Q.* 40:619–52
Gulati R, Gargiulo M. 1997. *Where do networks come from?* Work. Pap. Northwestern Univ. Grad. Sch. Mgmt.
Gulati R, Khanna T, Nohria N. 1994. Unilateral commitments and the importance of process in alliances. *Sloan Manage. Rev.* 35(3):61–69
Hamel G. 1991. Competition for competence and inter-partner learning within international strategic alliances. *Strat. Manage. J.* 12:83–103 (Summ. Suppl.)
Hannan MT, Freeman J. 1989. *Organizational Ecology.* Cambridge, MA: Harvard Univ. Press
Hennart J. 1988. A transaction costs theory of equity joint ventures. *Strat. Manage. J.* 9: 361–74
Hennart J. 1991. The transaction costs theory of joint ventures: an empirical study of Japanese subsidiaries in the United States. *Manage. Sci.* 37:483–97
Hirschman AO. 1970. *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States.* Cambridge, MA: Harvard Univ. Press
Inkpen AC. 1996. Creating knowledge through collaboration. *Calif. Manage. Rev.* 39:123–40
Kanter RM. 1991. The future of bureaucracy and hierarchy in organizational theory: a report from the field. See Bourdieu & Coleman 1991, pp. 63–90
Killing JP. 1982. How to make a global joint venture work. *Harvard Bus. Rev.* 60:3
Kogut B. 1988a. A study of the life cycle of joint ventures. *Manage. Int. Rev.* 28:39–52
Kogut B. 1988b. Joint ventures: theoretical and empirical perspectives. *Strat. Manage. J.* 9:319–32
Larson A. 1992. Network dyads in entrepreneurial settings: study of the governance of exchange relationships. *Admin. Sci. Q.* 37: 76–104
Laumann EO. 1991. Comment on "The Future of Bureaucracy and Hierarchy in Organizational Theory: A Report from the Field." See Bourdieu & Coleman 1991, pp. 90–93
Lazerson M. 1993. Future alternatives of work reflected in the past: the putting-out production in Modena. In *Explorations in Economic Sociology,* ed. R Swedberg, pp. 403–28. New York: Russell Sage Found.
Levitt B, March JG. 1988. Organizational learning. *Annu. Rev. Sociol.* 14:319–40
Liebeskind JP, Oliver AL, Zucker LG, Brewer M. 1996. Social networks, learning, and flexibility: sourcing scientific knowledge in new biotechnology firms. *Org. Sci.* 7: 428–43
Lincoln JR, Gerlach ML, Ahmadjian C. 1992. Keiretsu networks in the Japanese economy: a dyad analysis of intercorporate ties. *Am. Sociol. Rev.* 1992:57:561–85
Lincoln JR, Gerlach ML, Ahmadjian C. 1996. Keiretsu networks and corporate performance in Japan. *Am. Sociol. Rev.* 61:67–88
Mody A. 1993. Learning through alliances. *J. Econ. Behav. Org.* 20:151–70
Mowery DC, Oxley JE, Silverman BS. 1996. Strategic alliances and interfirm knowledge transfer. *Strat. Manage. J.* 17:77–91 (Summ. Suppl.)
Orru M, Biggart NW, Hamilton GG. 1991. Organizational isomophism in East Asia. In *The New Institutionalism in Organizational Analysis,* ed. WW Powell, PJ DiMaggio, pp. 361–89. Chicago: Univ. Chicago
Parkhe A. 1991. Interfirm diversity, organizational learning, and longevity in global strategic alliances. *J. Int. Bus. Stud.* 22: 579–601
Parkhe A. 1993. Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. *Acad. Manage. J.* 36:794–829
Perrow C. 1993. Small firm networks. In *Explorations in Economic Sociology,* ed. R Swedberg, pp. 277–402. New York: Russell Sage Found.
Pfeffer J, Nowak P. 1976. Joint-ventures and interorganizational interdependence. *Admin. Sci. Q.* 21:398–418
Podolny JM. 1993. A status-based model of market competition. *Am. J. Sociol.* 98: 829–72
Podolny JM. 1994. Market uncertainty and the social character of economic exchange. *Admin. Sci. Q.* 39:458–83
Podolny JM, Phillips DJ. 1996. The dynamics of organizational status. *Ind. Corp. Change* 5:453–72
Portes A, Sensenbrenner J. 1993. Embeddedness and immigration: notes on the social determinants of economic action. *Am. J. Sociol.* 98:1320–50
Powell WW. 1990. Neither market nor hierarchy: network forms of organization. In *Research in Organizational Behavior,* ed. B Staw, LL Cummings, 12:295–336. Greenwich, CT: JAI
Powell WW, Brantley P. 1992. Competitive cooperation in biotechnology: learning through networks? In *Networks and Organizations: Structure, Form and Action,*

ed. N Nohria, R Eccles, pp. 366–94. Boston: Harvard Bus. Sch.
Powell WW, Koput KW, Smith-Doerr L. 1996. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. *Admin. Sci. Q.* 41:116–45
Powell WW, Smith-Doerr L. 1994. Networks and economic life. In *The Handbook of Economic Sociology,* ed. NJ Smelser, R Swedberg, pp. 368–402. Princeton, NJ: Princeton Univ. Press
Root RR. 1988. Some taxonomies of international cooperative arrangements. See Contractor & Lorange 1988a, pp. 69–80
Savona D. 1992. When companies divorce. *Int. Bus.* 5(11):48–51
Selznick P. 1949. *TVA and the Grass Roots.* Berkeley, CA: Univ. Calif. Press
Sharfman MP, Gray B, Yan A. 1991. The context of interorganizational collaboration in the garment industry: an institutional perspective. *J. Appl. Behav. Sci.* 27:181–208
Sørenson O. 1997. *Complexity catastrophe: interdependence and adaptability in organizational evolution.* Work. Pap. Univ. Chicago Grad. Sch. Bus.
Stark D. 1996. Recombinant property in East European capitalism. *Am. J. Sociol.* 101: 993–1027
Stinchcombe A. 1965. Social structures and organizations. In *Handbook of Organizations,* ed. JG March, pp. 142–93. Chicago: Rand McNally
Stuart TE, Hoang H, Hybels R. 1997. *Interorganizational endorsements and the performance of entrepreneurial ventures.* Work. Pap. Univ. Chicago Grad. Sch. Bus.
Stuart TE, Podolny JM. 1996. Local search and the evolution of capabilities. *Strat. Manage. J.* 17:21–38
Stuart TE, Podolny JM. 1997. *Positional causes and consequences of strategic alliances in the semiconductor industry.* Work. Pap. Univ. Chicago Grad. Sch. Bus.
Stuckley JA. 1983. *Vertical Integration and Joint Ventures in the Aluminum Industry.* Cambridge, MA: Harvard Univ.
Uzzi B. 1996. The sources and consequences of embeddedness for the economic performance of organizations: the network effect. *Am. Sociol. Rev.* 61:674–98
Uzzi B. 1997. Networks and the paradox of embeddedness. *Admin. Sci. Q.* 42:35–67
Westney DE. 1988. Domestic and foreign learning curves in managing international cooperative strategies. See Contractor & Lorange 1988a, pp. 339–46
Williamson OE. 1975. *Markets and Hierarchies.* New York: Free
Williamson OE. 1985. *The Economic Institutions of Capitalism.* New York: Free
Williamson OE. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Admin. Sci. Q.* 36: 269–96
Zajac EJ, Olsen CP. 1993. From transaction cost to transactional value analysis: implications for the study of interorganizational strategies. *J. Manage. Stud.* 30:131–45